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FEHMARNBELT FIXED LINK –
TUNNEL DESIGN SERVICES

CONCEPTUAL DESIGN
REVISION 6C

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Date	**2014/09/01**
Made by	**Kristina Hoffmann Larsen/Jesper Pedersen/Frederik Sørensen**
Checked by	**Jesper Pedersen/Kristina Hoffmann Larsen/Frederik Sørensen**
Approved by	**Dick Kevelam**
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Disclaimer
The text and drawings presented in this report are developed in the course of the planning process and should be considered as work in progress and not representing a final position or determination unless otherwise explicitly stated.

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1. INTRODUCTION AND PROCEDURE

1.1 Introduction

This report presents the operational risk analysis (ORA) for the Fehmarnbelt Fixed Link Tunnel. The ORA combines the frequency estimation (ref. [1]) with the consequence estimation (this report) to calculate the risk and then compares the risk with the acceptance criteria from ref. [28].

1.2 Procedure

The operational risk analysis procedure is described in details in the ORA Accident Frequencies Report ref. [1].

1.3 Event overview and affected safety targets

All background information needed in order to setup risk modelling in the ORA has been presented in the ORA Accident Frequencies Report, ref. [1] .

In Table 1-1 all the identified events are shown together with the affected safety targets; fatalities on road, fatalities on rail (both passengers and employees), disruption on road, disruption on rail and repair cost. The numbers in the table are references to sections in this report. If there are numbers opposite a given event, it means that the event has an effect on the relevant safety targets. The consequences are described in more details in the referred sections. A corresponding table containing references to sections containing descriptions of frequencies for each of the risk are given in the ORA Accident Frequencies Report (ref. [1]).

Initiating events	Fatalities Road	Fatalities/injuries Rail (both passengers and employees)	Disruption Road	Disruption Rail	Repair cost
Ordinary road accidents					
Ordinary road traffic accident	4.3.1.1		4.3.1.2		4.3.1.2
Road accident involving DG					
Ammonia	4.3.2.1.1		4.3.2.1.2		4.3.2.1.2
Chlorine	4.3.2.2.1		4.3.2.2.2		4.3.2.2.2
Corrosives	4.3.2.3.1		4.3.2.3.2		4.3.2.3.2
Explosives	4.3.2.4.1	4.3.2.4.1	4.3.2.4.2	4.3.2.4.2	4.3.2.4.2
Fire – road					
Car	4.3.3.1.2		4.3.3.2, 4.3.3.3	4.3.3.2	4.3.3.2, 4.3.3.3
Bus	4.3.3.1.2		4.3.3.2, 4.3.3.3	4.3.3.2	4.3.3.2, 4.3.3.3
HGV (excl. DG)	4.3.3.1.2		4.3.3.2, 4.3.3.3	4.3.3.2	4.3.3.2, 4.3.3.3
DGV	4.3.3.1.2		4.3.3.2, 4.3.3.3	4.3.3.2	4.3.3.2, 4.3.3.3
Ordinary rail accidents					
Train collisions		4.4.2.1	4.4.2.2.3	4.4.2.2.2	4.4.2.3
Train derailment		4.4.2.1	4.4.2.2.3	4.4.2.2.1	4.4.2.3
Train object collision		4.4.2.1	4.4.2.2.3	4.4.2.2.2	4.4.2.3
Fire – rail					
Passenger train		4.4.5	4.4.5.1	4.4.5.1, 4.4.5.2	4.4.5.1, 4.4.5.2
Freight train excl. DG		4.4.5	4.4.5.1	4.4.5.1, 4.4.5.2	4.4.5.1, 4.4.5.2
Rail accidents involving DG					
Ammonia		4.4.3.1.1		4.4.3.1.2	4.4.3.1.2
Chlorine		4.4.3.2.1		4.4.3.2.2	4.4.3.2.2
Corrosives		4.4.3.3.1		4.4.3.3.2	4.4.3.3.2
Explosives	4.4.3.4	4.4.3.4	4.4.3.4	4.4.3.4	4.4.3.4
External events					
Flooding			4.5.1	4.5.1	4.5.1
Dropped and dragged anchor	4.5.4	4.5.4	4.5.4	4.5.4	4.5.4
Grounding ship	4.5.5	4.5.5	4.5.5	4.5.5	4.5.5
Fire in transformer room			4.5.3	4.5.3	4.5.3
Sunken ship	4.5.2	4.5.2	4.5.2	4.5.2	4.5.2
Multiple simultaneous events (fire/toxic release and accident causing congestion)	4.6		*		*

Table 1-1 Events distributed on safety targets with references to relevant sections. *Disruption and repair costs are assessed under fire and toxic release respectively.

The frequency report (ref. [1]) also contains a section with description of how each topic in TSI SRT (ref. [32]) is handled in the ORA.

2. SUMMARY

This report details the operational risk assessment for the design of the Fehmarnbelt Fixed Link Tunnel. Within this report the following safety targets are considered:

- Individual risk to road and rail users (both passengers and employees)
- Third party risk
- Societal risk
- Risk of disruption (including repair cost)
- Environmental risk
- Risk to maintenance/inspection personnel

For all safety targets the risk is estimated. In all analysed cases the risk is considered acceptable.

2.1 Individual risk

In Table 2-1 the risk figures are presented for the year 2025 and 2045 as well as the corresponding acceptable risk level. The risks are presented for the following safety targets:

- Road users (fatalities)
- Rail passengers (FWSI)
- Rail employees (FWSI)
- Others (FWSI)

	2025			2045		
	Individual Risk	Acceptable Risk	Fraction of acceptable risk	Individual Risk	Acceptable Risk	Fraction of accep-table risk
Road fatalities	0.17	0.22	74.0%	0.13	0.17	75.1%
Rail - FWSI – passengers	$2.60 \cdot 10^{-3}$	0.0031	84.2%	$2.78 \cdot 10^{-3}$	0.00309	90.0%
Rail - FWSI – employees	$8.81 \cdot 10^{-4}$	0.0109	8.0%	$1.22 \cdot 10^{-3}$	0.01486	8.2%
Rail - FWSI – Others	$1.15 \cdot 10^{-5}$	0.0035	0.3%	$1.72 \cdot 10^{-5}$	0.00346	0.5%

Table 2-1 Individual risk (the number of fatalities and FWSI per billion person passages) and acceptable risk on road and rail in 2025 and 2045

It is noted that are risk figures are below the acceptance criteria, i.e., the risk is considered acceptable.

In the estimation of the risk to employees it is seen that the risk only contributes a small part of the acceptance criteria. In the modelling no risk model for harm to maintenance personal due to rolling stock has been carried out. Clearly, there must be "room" for the risk in the acceptance criteria. With only 8% used, it is assessed that the risk for maintenance personal including FWSIs due to rolling stock is considered acceptable.

Finally, it is seen that the risk for Others only constitute 0.3% of the acceptance criteria. This is simply due to the low impact the railway has on the surroundings. Regarding Others it is underlined that the risk to persons in cars, buses etc. that have been stopped outside the tunnel due to an accident in a railway tube must to investigated further. They may be at risk if smoke from a fire or a toxic release is ventilated to this area.

2.2 Third party risk

No third party risks have been identified.

In previous versions of the ORA the scope was chosen to be the enclosed tunnel part. In this case no unauthorized persons are expected to enter the tunnel, as they will have to pass several physical barriers, and the surveillance system will make sure that persons entering the area would be seen and possibly stopped. Hence, persons entering the tunnel are persons who deliberately choose to pass the physical barriers and they are considered similar to train-surfers etc. who are omitted in a similar way as people committing suicide. However, considering the free road and railway passages on the landsides there may be a risk that people will cross the road and railway areas unauthorized, see ref. [33]. These stretches are, however, not different from any other highway or railway in Denmark/Germany where crossing is not permitted, so there is no argument for that the risk should be intolerable. Considering the location in the country-side and that the area is partly closed, the risk is assessed not to be higher than similar stretches in Denmark/Germany. Due to the above descriptions third party risk is not included in the analysis.

2.3 Societal risk (section to be updated autumn 2014)

The societal risk is the sum of the individual risk on road and rail and third party risk. The results are presented in Table 2.2 in comparison to the acceptance criteria. The societal risk is considered acceptable in both 2025 and 2045.

	Societal Risk 2025	Acceptable Risk 2025	Societal Risk 2045	Acceptable Risk 2045
Fatalities per year	0.18	1.64	0.15	2.70

Table 2-2 Societal risk and acceptable risk in 2025 and 2045

2.4 Risk of disruption

The calculated disruption risk for road and rail individually and simultaneously is presented in Table 2-3 and is considered acceptable. It is conservatively assumed, that the disruption covers both tubes for road and rail respectively.

	2025	2045	Acceptable Disruption
Road tunnel disruption (days per year)(road alone*)	0.60	0.96	6.50
Rail tunnel disruption (days per year) (rail alone*)	0.13	0.15	
Simultaneous road and rail disruption (days per year)	0.41	0.46	0.60

Table 2-3 Tunnel disruption in days per year (* does not include simultaneous disruption)

From Table 2-3 it is seen that it is acceptable to disrupt the railway 0.6 days a year. This disruption may come from an event disrupting the rail alone or an event giving a simultaneous disruption.

2.5 Environmental risk

No environmental risks have been identified.

In general all spillage (from e.g. trains/vehicles with dangerous goods) will be collected in the drainage system from where it will be pumped to vehicles and handled in a proper way.
A scenario where the environment could be affected by e.g. dangerous goods is if the tunnel collapses (e.g. caused by explosion). In this case some, considering the case, relative small amount of substances will be able to flow into the sea. However, considering all other consequences of a tunnel collapse, which will happen extremely rare, this consequence will be relative low. The tunnel is high safety class and can withstand a very high overpressure.

2.6 Maintenance risk

Railway maintenance personal is included in the acceptance criteria for rail employees, which is a group of persons defined in relation to the railway system in the CST and NRV's.

Persons carrying out maintenance work according to strict procedures. The following hazards that may occur have been identified:

1) Person(s) injured/killed by electrocution by the overhead catenary system
2) Person(s) injured/killed by falling e.g. on stairs
3) Person(s) injured/killed due to train in motion

(1) Is not different than any other railway section/line in Denmark/Germany with an overhead catenary system, and the work is carried out under legislation such as the High Voltage Directive (The National Electrical Code Standard Handbook).
(2) Workers doing maintenance work will walk and use stairs. The risk of falling is of course present. Stairs will, however, be designed following standard health and safety legislation, e.g. Consolidation act on the Working Environment *(In Danish: Arbejdsmiljøloven)*.
(3) Is not covered by the quantitative risk model.

Because no quantitative risk model is carried out for 3), it is important that there is some "room" for risk in relation to maintenance personal in the acceptance criteria for employees.

For a detailed list of hazards, see ref. [33].

2.7 Unauthorized persons on railway premises

Unauthorized persons are a group of persons defined in relation to the railway system in the CST and NRV's.

Unauthorized persons are persons that deliberately gain access to the railway part of the system without being authorized. One can imagine the following situations:

1) On or more persons "surf" on the outside of the train. The person can e.g. get access to this on a station near the tunnel.
2) Graffiti painters.
3) One or more persons choose to enter the railway area and follow the track in order to walk to the other side of the tunnel using the railway track.
4) Persons that cross the railway track on the landsides.

The area around the tunnel will have a fence and signs, etc. so no persons will enter the area without knowing that it is not allowed.

Train surfers (1) and graffiti-painters (2) that deliberately choose to go into the system knowing very well the danger of the actions they do. Other persons along the track (3) will be similar to (1) and (2).

A detailed list of hazards can be found in ref. [33].

Considering the location of the tunnel far away from larger cities, it is assessed that the likelihood of occurrence of the identified hazards are less than in other/similar railway sections/lines in Denmark/Germany. Hence, the risk for these types of events is considered not worse than the average safety level in Denmark/Germany.

2.8 "Others"

"Others" is a group of persons defined in relation to the railway system in the CST and NRV's. For this railway system the users of the road part will be considered as "others". An explosion in the railway part is an example of an event, where people in the road part may be affected.

Neighbors are considered to be so far away from the tunnel portals that they will not be affected by accidents with dangerous goods (toxic gasses or smoke) in the tunnel.

Cars which are stopped outside the tunnel in case of an accident in the tunnel will be stopped by barriers approximately 400 m outside the tunnel on the German side and approximately 250 m outside the tunnel on the Danish side. It is assumed, that procedures will ensure that no people in the cars will be affected by accidents with dangerous goods (toxic gasses or smoke) in the tunnel even though a large toxic release inside the tunnel probably can affect people 250 m outside the tunnel.

This means that only people on the road part of the system will be included in the risk assessment of "others".

3. SAFETY TARGETS AND RISK ACCEPTANCE CRITERIA

The consequences of each of the selected hazards and accidents are assessed against a number of key criteria. These are presented and described in detail in ref. [3] and shown in Table 3-1.

Safety target	Measure	Related to
1. Individual risk to road users	FAT/Year	Road
2. Individual risk to rail passengers (NRV1.1)	FWSI/Year	Rail
3. Individual risk to rail employees (NRV 2)	FWSI/Year	Rail
4. Risk to level crossing users (NRV 3)	FWSI/Year	Rail
5. Risk to others (NRV 4)	FWSI/Year	Rail
6. Risk to unauthorised persons on premises (NRV 5)	FWSI/Year	Rail
7. Third party risk	FWSI/Year	Road and rail
8. Societal risk (composed of 1 to 7)	FAT/Year, F-N representation	Road and Rail
9. Risk of disruption	Days/Year F-N representation	Road and Rail
10. Environmental risk	Euro/Year	Road and Rail

Table 3-1 Safety targets

Furthermore, for all hazards the repair cost has been estimated. However, no risk acceptance criteria have been setup with respect to cost.

3.1 FAT to FWSI conversion factors

In previous versions of the ORA, the risk has been estimated as a number of fatalities. However, railway safety targets are measured in terms of Fatalities and Weighted Serious Injuries (FWSI) per year. The connection between fatalities (FAT), FWSI and serious injuries (SI) can be estimated on basis of data for accidents, showing a number of fatalities and serious injuries.

The following relation illustrates the connection:

$$FWSI = FAT + w_1 \cdot SI$$

where:

$$SI = w_2 \cdot FAT$$

Based on the above relations between FWSI and FAT, a conversion factor can be estimated for each of the safety targets relating to rail, so that conversion can be summarized in a single factor:

$$FWSI \cong C \cdot FAT$$

W_1 is defined in ref. [30] and ref. [31] to 0.1, i.e. 10 seriously injured weights as 1 fatality. W_2 differs for each of the safety targets relating to rail and have been estimated in ref. [29]. The resulting conversion factors are shown in Table 3-2.

Safety target	Abbreviation	Conversion factor
Passengers	$C_{passenger}$	1.4
Employees	$C_{employee}$	1.4
Level crossing users	$C_{level\ crossing}$	1.05
Unauthorized persons	$C_{unauthorized}$	1.04
Other persons	C_{others}	1.1

Table 3-2 FAT to FWSI conversion factors for rail, ref. [29]

The conversion factors will be used to estimate the number of FWSI based on FAT.

For road users the corresponding W_2 is found from ref. [5], and the resulting conversion factor is shown in Table 3-3.

Safety target	Abbreviation	Conversion factor
Raod users	C_{road}	1.6

Table 3-3 FAT to FWSI conversion factors for road

3.2 Quantified acceptance criteria

Detailed calculations for establishing quantified acceptance criteria have been presented in ref. [3]. The results are summarized in Table 3-4.

Risk Acceptance Criteria	2025	2045
Risk to road users (FAT/passage)	0.223	0.174
Risk to rail passengers (FWSI/year)	$3.09 \cdot 10^{-3}$	$3.09 \cdot 10^{-3}$
Risk to employees (FWSI/year)	$1.09 \cdot 10^{-2}$	$1.49 \cdot 10^{-2}$
Risk to level crossing users (FWSI/year)	-	-
Risk to others (FWSI/year)	$3.67 \cdot 10^{-3}$	$4.98 \cdot 10^{-3}$
Risk to unauthorized persons on premises (FWSI/year)	0.136	0.185
Third party risk (FWSI/year)	-	-
Societal risk (FAT/year)	1.64	2.70
Risk of disruption to road (days/year)	6.5	6.5
Risk of disruption to road (days/year)	0.6	0.6
Risk of simultaneous disruption (days/year)	0.6	0.6
Environmental risk (Euro/year)	-	-

Table 3-4 Overview of the risk acceptance criteria

3.3 Cost of safety targets

According to the latest recommendations from the Danish Ministry of Finance ("Høringsversion af vejledning til samfundsøkonomisk analyse fra Finansministeriet") the value of a statistical life (VSL) is 16 million DKK or approximately 2.1 million Euros in 2007 prices. This corresponds to 2.3 million Euros in 2009 prices.

The value from "Høringsversion af vejledning til samfundsøkonomisk analyse fra Finansministeriet" is recommended as the preference value to be used for fatalities. This corresponds to 2025 and 2045 values in 2025 prices as given in Table 3-5.

	2025	2045
Cost of one fatality, Million Euro	3.1	4.3

Table 3-5 Cost of fatalities in million Euros in 2025 prices

The cost of disruption relates to the extra cost for the society and the owners loss due to the disruption. The societal cost is described by the extra time and distance that the users of the Link are subject to in case of shorter or larger disruptions.

The basic assumption is that the traffic (both road and rail) will be lead over the route of the Great Belt Bridge in case of closure of the Fehmarnbelt Fixed Link. The traffic is for simplicity assumed to go through Copenhagen and Hamburg. Possible remedial transport in case of very long disruptions is disregarded when assessing the cost values.

The calculated disruption costs are calculated based on unit prices for traffic economy issued by the Danish Ministry of Transport, see ref. [11]. In general there is an initial cost for an event causing disruption. This "start-up" cost is indicated in Table 3-6.

	Road		Rail		Entire link	
	2025	2045	2025	2045	2025	2045
Initial start-up cost Per event (€m)	0.08	0.14	0.06	0.12	0.14	0.26

Table 3-6 Initial cost of an event causing disruption of part of or the entire link in million Euros in 2025 prices

Having an initial cost per disruption implies that longer disruptions are less expensive per day, than shorter disruptions. In Table 3-7 are indicated the disruption costs for a day, a week, a month, six months and a year.

Societal disruption cost Million Euros	Road		Rail		Entire link	
	2025	2045	2025	2045	2025	2045
Per day	1.66	3.13	0.71	1.27	2.37	4.4
Per week	11.14	21.07	4.54	8.24	16.96	30.87
Per month	47.45	89.74	14.31	28.47	66.79	124.51
Six Months	288.43	545.815	116.86	211.82	439.48	799.43
A year	576.43	1,090.23	171.46	342.7	810.98	1,511.97

Table 3-7 Societal cost of disruption of part of or the entire link in million Euros in 2025 prices

It is seen that closing the entire link is relatively more costly than closing either the road or the rail individually. This is because some transport originally planned for the closed part, can use the non-closed part instead e.g. road tunnel users can go by train or freight can be transported by road instead of rail.

The owners' loss due to disruption is calculated on basis of the expected income for 2025 (1871 million DKK) from ref. [12], and it is extrapolated to 2045 based on ref. [11].

Expected owners loss 2025 in €m (ex VAT)	Road part		Railway part		Entire link	
	2025	2045	2025	2045	2025	2045
Per day	0.560	0.836	0.129	0.192	0.662	1.060

Table 3-8 Owner loss due to disruption of part of or the entire link in million Euros in 2025 prices

Owners' loss is assumed to be linearly dependent on time; hence the owners' loss per week equals 7 times the loss for one day. In case of disrupting the entire link the owners' loss in 2025 and 2045 has been scaled similarly to the societal costs.

In addition to the owner's loss the cost of repairing after an accident must be assessed. The costs are completely dependent on the type of accident, and hence these repair cost considerations are described in the sections covering the consequences of the different accidents.

Environmental damage is assumed related to clearing and cleanup of an oil spill. The SAFEDOR values ref. [10] which is also used in the Fehmarnbelt Fixed Link Navigational Studies ref. [8] is recommended used. This will also provide consistency in the assessments. Thus, a cost of 13,100 USD in 2006 prices equal to 9,200 € per spilled tonne of oil will be used. Other spills will - if relevant - be related to oil spill prices.

A rough extrapolation of this cost of environmental damage is presented in Table 3-9. Please note that the number in principle only covers the cleanup cost.

	2025	2045
Clean up cost per tonne , Euros	13,200	17,900

Table 3-9 Environmental damage in Euros in 2025 prices

4. CONSEQUENCE MODELLING

The following chapter describes the calculations and assessments carried out in order to assess the consequences of different events.

In order to assess the consequences of a given event, some issues are important to address, namely:

- Which safety target is affected by the accident?
  - Road users (fatalities)
  - Rail users (fatalities)
  - Disruption
    - Road part (alone)
    - Rail part (alone)
    - Simultaneous disruption of rail and road
  - Repair costs

- Population at the accident site
  - What is the traffic intensity at the time of the accident (e.g. difference between day and night)
  - Rush hour traffic (peak our traffic)
  - For train accidents, the number of passengers on the train(s) are important

- Location - where has the accident occurred?
  - On the landsides
  - In the enclosed tunnel
  - For railway accidents, evacuation procedures will be slightly different in the two railway tubes
  - Distance to emergency exits

4.1 Population distributions

In the event of an incident it is important to identify the population at the time of the accident and this is especially important when there is an ongoing risk to life safety such as a fire or toxic release. In the following sections the figures for road and railway are presented.

4.1.1 Road

The road tunnel population as defined by ref. [27] is shown in Table 4-1.

Road Traffic	2025	2045
Annual average daily traffic (AADT) [vehicles/day]	11723	19288
Cars	9819	15221
Cars (professional activities) 30%	2946	4566
Cars (private use) 70%	6873	10655
Lorries	1751	3851
Buses	153	215
Average person per vehicle	2.4	
Cars (professional activities)	1.2	
Cars (private use)	2.9	
Lorries	1.0	
Buses	35.0	
Average load per lorry in tons	15.5	

Table 4-1 Road tunnel traffic forecast and population

These figures for daily traffic flow and number of occupants per vehicle are average values. In the event of an incident the average occupancy is taken and sensitivity studies assessing higher or lower occupancy loading has not been considered at this time.

4.1.1.1 Average number of people in the road tubes in case of an road accidents

The traffic data forms the basis of the estimated number of passengers within the road tunnel in case of an accident. At first a representative average number of vehicles are estimated from the day, night and peak hour traffic on Scandlines ferries between Rødby and Puttgarden. The statistics from Scandlines (see Figure 4-1) show that there is peak hour traffic intensity for 5 hours a day, daytime traffic intensity for 12 hours and night time traffic intensity for 7 hours. The distributions are presented in Table 4-2.

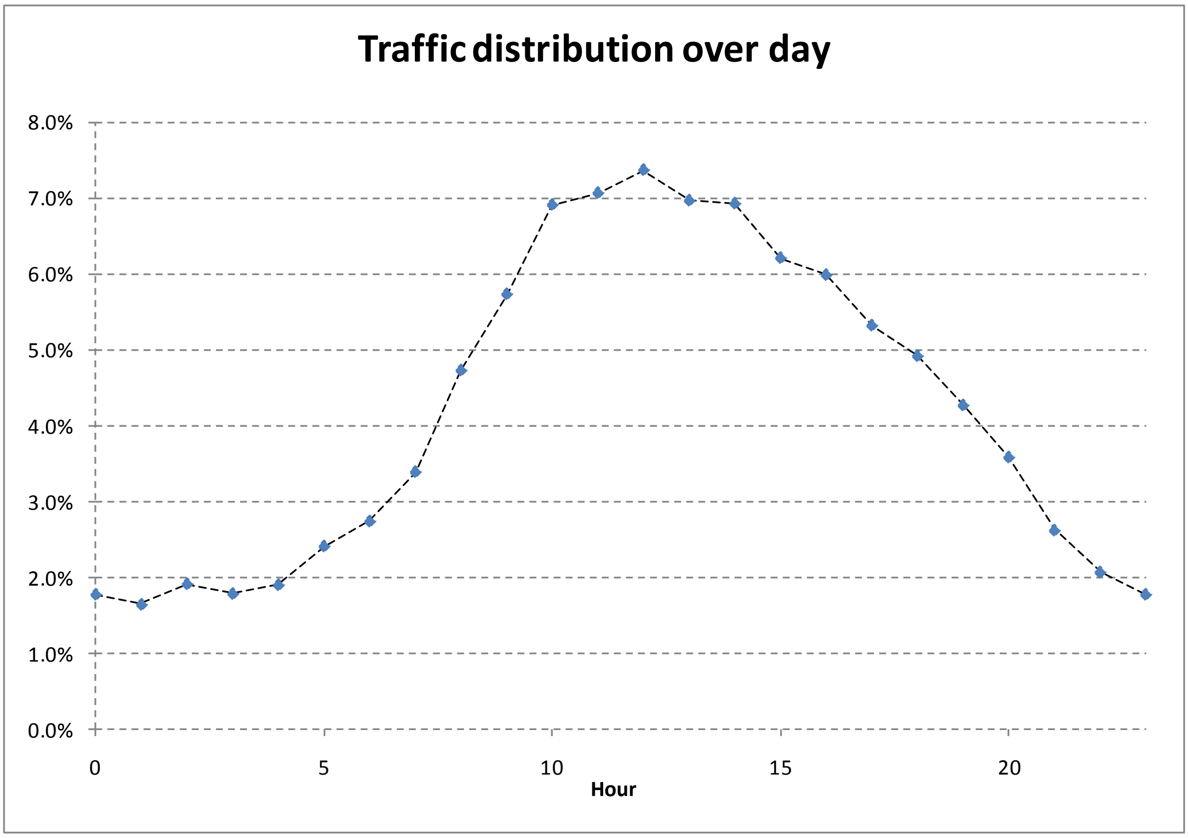

Figure 4-1 Traffic distribution over a day based on Scandlines data

		2025		2045	
Traffic	Percentage	Vehicles	Average value per hour	Vehicles	Average value per hour
Day time traffic (excl. Peak hour) 6-9, 13-22	52%	5723	504	9416	829
Peak hour traffic 10-15	35%	4129	826	6793	1359
Night time traffic 0-5, 23	13%	1871	221	3079	364
Total	**100%**	**11723**		**19288**	

Table 4-2 Traffic distribution on road

Choosing the middle of the tunnel as a representative location for accidents the number of cars upstream of accident in the tunnel can be estimated. The estimate is based on the assumption of an average speed of 90 km/h.

Furthermore it is assumed that the traffic into the tunnel will be stopped after 2 minutes. The estimated time to have the traffic stopped is short, but is based on the presence of the traffic management system and VAID system to be provided in the tunnels.

Assuming that accidents occur at the middle of the tunnel on average the number of vehicles in a queue is calculated by the following formula:

$$N_v = \frac{A_0 (t_0 + t_s)}{3600}$$

N_V: vehicles in a queue
t_s: time to stop traffic in case of an accident (120 s)
t_o: time to drive to the middle of the tunnel at average speed, (364 s)
A_0: vehicles per hour per tube

If the stopping time is taken as 2 minutes and the traffic volume is taken as average daytime traffic, the number of vehicles and persons in the queue is presented in Table 4-3.

Vehicles in queue	Passengers per vehicle	Number of vehicles	People in the tunnel – Average of 2025 and 2045
Cars	2.4	72.7	173.9
Buses	35.0	1.1	39.7
Lorries	1.0	13.0	13.0
		Total	**226.5**

Table 4-3 Average number of vehicles and occupants in a queue in 2 tubes in case of an accident

4.1.2 Rail

The rail tunnel population as defined by ref. [27] is shown in Table 4-4.

Rail Traffic	2025	2045
Average number of freight trains per day	87	132
Average number of passenger trains per day	40	40
Passengers per passenger train	95	
Operators/workers on passenger train	2	
Operators/workers on freight train	1	
Average load per freight wagon (ton)	17.7	
Number of wagons per freight train	30	

Table 4-4 Rail tunnel forecast and number of passengers per train

These figures for daily traffic flow and number of occupants per train are average values. In the event of an incident the average occupancy is taken and sensitivity studies assessing higher or lower occupancy loading has not been considered at this time, as the acceptance criterion is defined with the average number of trains and persons.

4.1.2.1 Circumstances given a large accident

Considering a large accident in the modelling, e.g., explosion, grounding ship and other events that may lead to tunnel collapse, it is important to know the circumstances for the accident. In order to estimate the number of fatalities it is important to know how many cars and trains (and the corresponding number of passengers) are expected to be present in the tunnel at the time of the accident.

Analysing the train schedule for 2025, which is described in ref. [21], it is possible to estimate how many persons are present in a single railway tube at a given time, when the number of persons per train from Table 4-4 is used. The result is shown in Table 4-5.

Trains present in a single tube	Number of employees	Average number of passengers	Fraction of time
3 trains in tube	0	0	0
2 trains (Freight-Freight)	2	0	1,78%
2 trains (Freight-Pass. or Pass.-Freight)	3	95	0,60%
2 trains (Pass.-Pass.)	4	190	0,05%
1 train (Freight)	1	0	34,70%
1 train (Pass.)	2	95	11,44%
Total time with trains in tube	-	-	48,56%
Time without trains in tube	0	0	51,44%

Table 4-5 Fraction of time with different train scenarios

If the accident is caused by an external factor (e.g. a grounding ship leading to tunnel leakage/flooding) the number of persons (both passengers and employees) in the railway part can be estimated using the table.

Assuming (conservatively) that in these "catastrophic" scenarios that 95% of the persons in the tunnel will be fatalities, a distribution for the expected number of fatalities for passengers are given in Table 4-6 and Table 4-7.

Passengers								
Mean	0	1	3	10	30	100	300	Total
21,83	87,92%	0%	0%	0%	0,96%	5,91%	5,21%	100,00%

Table 4-6 Distribution of 95% of the expected number of passengers on railway in both railway tubes

Employees								
Mean	0	1	3	10	30	100	300	Total
1,20	53,17%	20,14%	23,88%	2,81%	0%	0%	0%	100,00%

Table 4-7 Distribution of 95% of the expected number of employees on railway in both railway tubes

It is seen that on average over time 21.8 railway passengers are present at the same time in the tunnel, while the corresponding number on average for employees is 1.2.

Whenever a specific train is involved in the accident, i.e., if an explosion is caused by a freight train carrying dangerous goods then, this information is taken into account. Knowing that one freight train is already present in the tunnel the conditional probabilities that one or more train is present can be estimated on basis of Table 4-5. Furthermore, it is taken into account if the accident is a derailment or a collision. Finally, the possible dangerous goods restriction is also taken into account and the impact it has on the presence of passengers when there is a large accident.

4.2 Fatalities on road and rail

The number of fatalities (and hence FWSIs using the relations in section 3.1) for a given event is modelled based on a scale from zero through to the maximum number of occupants. The majority of ordinary road accidents will lead to no fatalities. Conversely for a large toxic release the probability of there being fatalities is higher. For all distributions for all the modelled events see Appendix D.

As an example, ordinary accidents are assessed by means of the numbers presented in Table 4-8.

Individual risk [fatalities]	0	1	3	10	30	100	300
Probability	95.68%	4.22%	0.10%	0%	0%	0%	0%

Table 4-8 Example scale used for assessing number of fatalities and the distribution

In general these assessments are carried out on the basis of statistics, whenever available, and when no information has been available, best engineering judgements have been made. In the example given in Table 4-8 there is – given an accident - 95.7% chance that there are no fatalities, 4.2% of 1 fatality, 0.1% of 3 fatalities etc. This gives an average of 0.019 fatalities per accident.

For each accident scenario the probabilities in Table 4-8 are assessed for both road and rail, respectively. The reason for assessing the distribution, and not only using the average value, is to be able to represent the results by means of FN-curves, see e.g. ref. [4].

4.2.1 Disruption road and rail

Disruption times on road and rail in the event of an incident are assessed in a similar way to fatalities with an example shown in Table 4-9.

Disruption time [days per year]	0	1	7	14	30	180	365
Probability	75%	20%	4%	1%	0	0	0

Table 4-9 Example scale used for assessing the distribution of disruption time

In the example given in Table 4-9 the average disruption time is about 0.6 days per year corresponding to about 15 hours. The tables are assessed for both road and rail.

4.2.2 Repair costs

Besides assessing the disruption time, the costs of repairing the tunnel after an accident must be assessed. This is measured on similar scales as fatalities and disruption; presented in Table 4-10.

Repair cost [Euro]	10^3	10^4	10^5	10^6	10^7	10^8	10^9
Probability	0%	20%	70%	10%	0%	0%	0%

Table 4-10 Example scale used for assessing the repair cost distribution

The distribution in Table 4-10 leads to an average cost of $1.72 \cdot 10^5$ Euro.

4.3 Road

In the following sections the consequences of all events occurring in the road part of the tunnel are presented, these are:

- Ordinary traffic accidents
- Ordinary accidents involving dangerous goods
- Fire

For each of the accidents the following parameters are assessed (if applicable):

- The distribution of fatalities
- The distribution of disruption time
  - Road part alone
  - Simultaneously disruption of road and rail
- Repair costs

It is underlined that these distributions are assessed based on statistics available and best engineering judgements. All assumptions made, are presented in the suitable sections.

4.3.1 Ordinary road accidents

Ordinary road accidents are for example colliding cars and normal traffic accidents. In the modelling these accidents have been divided into accidents involving cars, buses and trucks respectively. The latter leads to different consequences depending on if dangerous goods are involved; this is dealt with in section 4.3.2.

In general it is assumed that ordinary accidents (not leading to fires, explosions or release of dangerous goods) are relevant for the individual risk on road, disruption risk on road and on repair costs. Hence, the accidents do neither lead to fatalities nor disruption of the railway part.

4.3.1.1 Individual risk road

Data for fatalities on motorways has been collected from 1998 to 2009 by the Danish Road Directorate. However, the statistics include accidents that are not representative for the Fehmarnbelt Fixed Link tunnel. By using the VIS-database a range of accidents have been excluded, namely those including the following objects:

- Accidents as an example include pedestrians, horses and mopeds
- Turning accidents
- Accidents in crossings
- Accidents that occurs with opposite traffic
- Accidents that occurs because of slippery roads caused by snow or ice

When these accidents were excluded from normal motorway accidents it resulted in a 12.6 percentage lower fatality rate per accident. The resulting fatality rates are shown in Table 4-11.

	2025	2045
Average number of fatalities per accident	0.029	0.019

Table 4-11 Distribution of fatalities in ordinary road accidents on Fehmarnbelt Fixed Link Tunnel

The values have been distributed according to different types of accidents with assumptions made for larger accidents which are typically not seen in the statistics.

It is underlined that statistics for accidents involving different vehicles types, such as cars, buses and trucks were investigated in order to see if there was any difference in the average number of fatalities in an accident. However, there was a small tendency that when a larger vehicle (bus or truck) was involved the average number of fatalities was slightly and not significantly larger. Hence, for simplicity the same fatality distribution has been used in the consequence modelling for cars, buses and trucks.

4.3.1.2 Disruption risk and repair costs

In general there is not data available about for how long a time an ordinary accident will disrupt the link and therefore engineering judgement has been made. Similarly values for the repair costs are not readily available and have been assumed.

In general it is assumed that ordinary traffic accidents (not leading to fires, explosions or release of dangerous goods) may lead to some downtime but do not lead to significant repair costs as shown in Table 4-12.

Vehicle type	Mean disruption time [min]	Mean repair costs [Euro]
Car	60	2500
Truck	90	5000
Bus	120	5000

Table 4-12 Average disruption time for a traffic accident

It is noted that the values are average values for all accidents; some accidents will only disrupt the traffic for a few minutes taking the vehicle(s) to the emergency lanes while other accidents will lead to longer disruption times.

4.3.2 Road accidents involving dangerous goods

A fraction of the traffic accidents involve vehicles transporting dangerous goods. This implies that some of the accidents will lead to release of toxic, flammable or explosive materials. In order to assess the consequences of a release of such materials, CFD-modelling has been carried out for representative substances. This includes dispersion analyses of LPG, chlorine and ammonia. The consequences of selected release sizes are computed by means of the air-concentrations at given locations of the given substances in the tubes. The results of the modelling are presented in ref. [3].

Comparing the release characteristics with the population at the accident time and location in the tunnel estimation of the number of fatalities can be carried out.

The persons at risk when there is a release can be divided into three groups:

- The truck driver
- People downstream the release
- People upstream the release

In general people downstream are supposed to drive out of the tunnel (with a significantly higher speed than the release propagates).

People upstream of the release are in general safe as long as the ventilation system works properly. For the ventilation system an uptime (availability) of 99% has been assumed. There will be some back-layering of the gases, the extent of which depends on the initial velocity of the wind speed in the tunnel (which again depends on the traffic amount) and the length of time it will take for the ventilation system to reach the critical velocity.

The truck driver is in general very exposed, due to that he will be located downstream the release. Conservatively it is assumed that the truck driver will be fatally injured in these scenarios.

4.3.2.1 **Release of ammonia**

4.3.2.1.1 Human impact

The human impact has been assessed by using the probit function to establish the LC50 and ppm value for ammonia as described in section 9.1.6.2. In the consequence assessment for road, it is assumed that by the time the air in the car has an ammonia concentration on 5 ppm (odour threshold), the air outside the car has reached the final concentration calculated by the CFD modelling, see section 9.1.5.2.The final concentration is of 4.200 ppm given a small release and a concentration of 40.000 ppm given a medium release.

The number of fatalities depends on the number of people in the tunnel. As presented in section 9.1.5.3, a medium release of ammonia gives a concentration of 40.000 ppm. Without ventilation this gives the people in the road tunnel between a half and one minute to evacuate into the central gallery. Similar to the evacuation study related to fire, see section 4.3.3.1.2, a pre-movement time of 60 seconds has been assumed and a walking speed of 1.2 m/s. The time it takes to evacuate the persons from the road tube depends on the number of passengers. There are on average 61 passengers in the tube.

Based on the evacuation assessment for fire in the road part, see section 4.3.3.1.2, it will take 2 minute and 24 seconds to evacuate a total of 113 passengers (the passengers in a region of 200 m behind the accident). This is a larger number of passengers then what are expected to be in the tunnel following a toxic release. However, the toxic gas may induce the passengers to move less rapidly, it is assumed that it will on average take 2 minute and 24 seconds to evacuate the 61 passengers as well.

The LC 50 calculations show that 50% of the passengers will die because of the ammonia gas if they are exposed during more than 1 minute given the concentration of 40,000 ppm. It is assessed that 50% of the passengers will be able to evacuate in one minute and that 50% of the remaining 50% will be killed by the gas. This gives an additional 25% fatality probability from a medium release of ammonia. It is assumed that a large release will give a higher concentration and hence that it will give a 50% higher additional fatality probability; of total 38%. Taking ventilation into account the fatalities are reduced by 99%. This is due to the ventilation system blowing the gas release away from the queued traffic. In Table 4-13 the results distributed on accident types are presented.

Consequence type			Average number of fatalities
Ammonia release	Ventilation failure (1% probability)	Small	0.03
		Medium	56.66
		Large	84.97
	Ventilation ok (99% probability)	Small	0.0003
		Medium	0.57
		Large	0.85

Table 4-13 Average fatalities as a consequence of dangerous goods accident resulting in release of ammonia in road tunnel

4.3.2.1.2 Disruption and repair cost

As described in section 9.1.5.3.1 the road tunnel will also need to be cleaned after a toxic release by washing the interior with water. The concrete, asphalt and different installations may need to be replaced. It is assessed that the repair costs is estimated to on average €5000.

The tunnel will be closed on between 2.5 to 4.5 hours given a release of ammonia, which is the downtime during cleaning of the tunnel.

4.3.2.2 Chlorine release

4.3.2.2.1 Human impact

The human impact has been assessed by using the probit function to establish the LC50 and ppm value for chlorine as described in section 9.1.6.2. In the consequence assessment for road it is assumed that by the time the air in the car has a chlorine concentration of 0.2 ppm (odour threshold), the air outside the car has reached the final concentration calculated by the CFD modelling, see section 9.1.5.2. The modelling results in a concentration of 4,200 ppm given a small release and a concentration of 40,000 ppm given a medium release.

The number of fatalities depends on the number of people in the tunnel. A concentration of 1,000 ppm can be fatal after a few deep breaths of the gas, it is assessed that very few passengers will be able to evacuate into the adjacent road tube (or central gallery) before they are affected by the gas. In section 4.4.3.1.1 it has been assumed that it will take a minimum of 1 minute to evacuate a car after the gas has been detected. It is assessed that this is also the case after a release of chlorine, it is therefore assessed that there will be an additional fatality probability of 50% caused by a medium chlorine release. It is assumed that a large release will give a higher concentration and it is assumed that it will give a 50% higher additional fatality probability of in total 75%. Taking ventilation into account the average number of fatalities are reduced by 99%. In Table 4-14 the result distributed on accident types is presented.

Consequence type			Average number of fatalities
Chlorine release	Ventilation failure (1%)	Small	0.03
		Medium	113.29
		Large	169.92
	Ventilation ok (99%)	Small	0.0003
		Medium	1.13
		Large	1.70

Table 4-14 Average fatalities as a consequence of dangerous goods accident resulting in release of chlorine in the road tunnel

4.3.2.2.2 **Disruption and repair cost**

The disruption time and repair costs are assumed to be the same as for ammonia, see section 4.3.2.1. Hence, repair costs are estimated to cost on average €5000 and a disruption of 2.5 to 4.5 hours, which is the estimated down time for cleaning.

4.3.2.3 **Corrosive release**

In this section the assessment of consequences following a dangerous goods accident which could lead to a release of corrosives in the road tube is presented.

4.3.2.3.1 **Human impact**

As described in section 9.1.4.1 it is assessed that there will not be any additional fatalities due to a corrosive release, and the consequences are therefore estimated to be the same as for an ordinary truck accidents.

4.3.2.3.2 **Disruption and repair cost**

The disruption time and repair costs are assumed to be the same as for ammonia and chlorine see section 4.3.2.1. Hence, repair costs are estimated to cost on average €5000 and a disruption of 2.5 to 4.5 hours, which is the estimated down time for cleaning.

4.3.2.4 **Explosions**

4.3.2.4.1 **Human impact**

As described in section 9.2 explosions caused by solid explosions, vapour cloud explosions and BLEVEs are assumed all to give the same consequences; namely collapse of a single tunnel element. This is an assumption since an explosion may cause collapse of more than one element. A collapse of one tunnel element due to an explosion in a road tube will affect vehicles and trains in the adjacent tube as well as the other tubes. It is assumed that the accident occurs in the middle of the road tunnel. Vehicles in both road tubes, which have just passed the collapsing element, are assumed to be able to drive out of the tunnel, while all trains in the tunnel will be affected. Conservatively assumed the accident leads to a 95% fatality rate inside in both road tubes for vehicles approaching the element and 95% fatalities for all trains in the tunnel. See section 4.1.2.1 for information on the presence of passengers during an accident.

The injuries and fatalities in the road part due to an explosion in the railway part is considered as “others”. See section 2.8 for details.

4.3.2.4.2 **Disruption and repair cost**

Estimated repair time is assumed about one year, where the entire tunnel has to be closed for traffic during the repairing period.

The repair cost is estimated to €500 million.

4.3.3 Fire - road

Four event trees with a range of scenarios have been setup for the enclosed tunnel part and four event trees covering the landsides; covering fire in cars, buses, HGVs and DGVs. For each of the fire scenarios it has been estimated how often a fire is detected, if the suppression system works and if ventilation works. For all four vehicle types this leads to a total of 44 fire scenarios in the enclosed tunnel part, and in total 8 scenarios on the landsides. The reason for having fewer scenarios on the landsides in the enclosed tunnel is simply due to the lack of mechanical ventilation and automatic suppression on the landsides.

4.3.3.1 **Safety to users**

For each of the scenarios the population in the area of the fire is considered taken into account the tenability criteria, described in the next section.

4.3.3.1.1 **Tenability criteria**

The tenability criteria describe the various parameters and at which levels people are expected to die, regarding:

- Visibility
- Thermal radiation
- Convective temperature
- CO concentration

The criteria have been chosen to be the following conservative values, ref. [16]:

- Visibility = 5 m
- Convective temperature = 100°C
- Thermal radiation = 2.5 kW/m^2
- CO Concentration = 1150 ppm

These criteria are used in the modelling in order to identify fatalities such that if a person is located in a region where the visibility is less than 5 m or in a region with convective temperature of 100^{O}C, then that person will be considered a fatality.

4.3.3.1.2 Evacuation modelling

Detailed evacuation modelling has been carried out using the Legion software, ref. [7], which takes into account:

- geometry of the tunnel,
- location of emergency exits,
- walking speeds
- how vehicles queue up upstream the fire
- congestion and queuing of occupants
- pre-movement characteristics (time before people starts to evacuate)

In general it is assumed that users are in safe areas in the non-incident tubes and in the central gallery. In order to be conservative, it is assumed that vehicles queue up quickly after the fire has started. In reality even with low volumes of traffic it will take a few minutes to fill up a distance of, say, 200 m behind the incident. This implies that the results are independent of the traffic volume, which again implies that the consequences following from a fire are the same in 2025 and 2045 (regardless that the traffic figures differ).

Important parameters used in the modelling are:

- Distance between emergency exits: 100 m
- Average walking speed of occupants: 1.2 m/s

The results of the evacuation modelling are that only 9 of the scenarios lead to fatalities see ref. [16]. The scenarios are presented in Table 4-15 .

Description	Fire Size (MW)	Detection	Suppression	Ventilation	Fatalities
Car	8	N	N	N	3
Bus	15	N	Y	N	3
Bus	30	N	N	N	3
DGV	20	N	Y	N	3
DGV	350	N	N	N	3
HGV	20	N	Y	N	3
HGV	50	N	N	N	3
HGV	20	N	Y	N	3
HGV	200	N	N	N	3

Table 4-15 The nine fire scenarios in the road part leading to fatalities

It is seen that fatalities will occur if both the detection system as well as the ventilation system must fail. In all scenarios a fire growth rate has been assumed which is identical regardless of the maximum fire size. In this respect, during an evacuation, occupants are exposed to identical conditions. It is only after the evacuation has been completed that the fire continues to grow to a much large fire size. Hence where fatalities are expected the number of fatalities is taken to be the same regardless of the maximum fire size.

4.3.3.2 Disruption and repair costs due to fires, enclosed tunnel

All fire scenarios are assumed to have a maximum heat release rate, measured in MW (Megawatts), and it is assumed that the consequences, in terms of disruption as well as repair costs, are related to peak fire size.

In ref. [6] the length of disruption and the repair costs are assessed for a 50MW fire and a 200MW fire if the fire incident is in the enclosed tunnel. These figures for disruption lengths and repair costs are primarily based on statistical data for fire incidents in tunnels where suppression systems have not been installed. Hence these figures are conservative upper limits. The selected figures for different fire sizes relevant for the fire modelling can be seen in Table 4-16.

Peak Fire size [MW]	Mean repair cost [Euro]	Mean disruption, incident tube [days]	Mean disruption, non-incident tubes [hours]
1	1,500	0.2	1
2.5	9,375	0.4	2
8	96,000	0.6	3
15	337,500	1	6
20	600,000	4	8
30	1,350,000	5	12 (0.5 day)
50	15,000,000	30	84 (3.5 day)
200	60,000,000	90	168 (7 days)
350	105,000,000	90	168 (7 days)

Table 4-16 Assessed repair cost and disruption length for a range of fire sizes in enclosed tunnel

4.3.3.3 Disruption and repair costs due to fires, land sides

For the landsides, fires are not expected to lead to fatalities, due to the possibility of escaping from the fire. Fires on landsides will, however, lead to disruption and to repair costs.

In general the repair costs and the disruption time will be much smaller if the fire is located on the landsides comparing with consequences of fire in the enclosed tunnel part. This is primarily due to that the amount of equipment is much larger in the enclosed tunnel part and that the tunnel structure is not damaged by a fire outside the tunnel areas.

Disruption lengths and repair costs are assessed for a range of selected fire sizes relevant for the fire modelling on the land side; the result can be seen in Table 4-17. In general it is assumed that the repair costs for fires on landsides are 1/10 of the repair costs for a similar fire in the enclosed tunnel part. For the same reasons the disruption time is much lower for fires on the land sides. A fire on e.g. the road part of a land side is assumed not to have any impact on disruption of the rail part, and vice versa. This is conservative

Fire size [MW]	Mean repair cost [Euro]	Mean disruption, incident "tube" [days]
1	150.00	0.2
2.5	937.50	0.4
15	33,750.00	0.5
30	135,000.00	1
200	6,000,000.00	2
350	10,500,000.00	2

Table 4-17 Assessed repair cost and disruption length for a range of fire sizes on the land sides

4.4 Rail

The consequence estimation for rail accidents has been divided into:

- Ordinary rail accidents (derailments, train collisions and train-object collisions)

- Accidents involving dangerous goods
- Fire (on rolling stock)

4.4.1 Consequence reducing measures

Derailment containment provisions are meant to mitigate the consequences of an initial derailment. They guide the derailed vehicle, preventing it from deviating further from the track, hitting other objects and turning over.

Derailment provisions will be installed in the tunnel by means of the elevated walkways, which will be designed to have adequate geometry (height and lateral position) and strength.

4.4.2 Ordinary rail accidents

The consequence estimation for rail accidents has been divided into derailments and collisions. Derailments have been divided into severe derailments, resulting in fatalities, and not severe derailments. Collisions have been divided into severe collisions and not severe collisions and into front-front collisions and front-end collisions.

4.4.2.1 Fatalities and injuries (FWSI)

The accident frequencies for collisions and train derailments are presented in ref. [1].

The maximum number of fatalities caused by ordinary railway accidents on the Fehmarnbelt Fixed Link is estimated on the basis of the number of people present on the trains. From Section 4.1.2 it can be seen that

- Only one person is assumed to be inside a freight train, namely the driver.
- On average 95 passengers and two employees (the driver and one other personnel) is assumed to be on passenger train.

Based on accident information from accidents in Europe, the distribution of fatalities in accidents with fatalities has been assessed. The number of fatalities has been divided into collision between trains, train collision with objects and derailments.

On basis of the statistics in ref. [34] the expected fatality fraction of the passengers, drivers and employees in Table 4-18 is established.

Fatality percentage	Passengers	Driver	Employees
Derailment	8.70%	54.90%	8.70%
Trains collision (front – end)	2.70%	29.60%	2.70%
Trains collision (front – front)	5.40%	59.20%	5.40%
Collision with object	2.90%	44.40%	2.90%

Table 4-18 Fatality percentages for train accidents with fatalities.

The figures are to be understood in the following way. The derailment scenario either leads to a severe accident causing fatalities or to a non-severe accident/incident causing no fatalities. In those cases where the derailment is severe, a fraction of 8.7% the passengers will be fatalities and similarly will the train driver die with a probability of 54.9%. It is underlined that these probabilities hold for accidents with severe consequences, on average including all accidents a much lower fraction of the passengers will die in a derailment.

Based on these data the average number of fatalities and FWSI for derailments, collisions between trains and train collision with objects has been estimated and presented in Table 4-19.

Accident type	Train(s) involved	Severity of accident	Estimated average number of employee FWSI	Estimated average number of passenger FWSI
Derailment	Freight train	Derailment without fatalities	0	-
		Derailment with fatalities	0.55	-
	Passenger train	Derailment without fatalities	0	0
		Derailment with fatalities	0.64	8.27
Collision	Freight trains	Front – end	0.59	-
		Front – front	1.00	-
	Passenger train/ freight train	Front – end	0.62	5.13
		Front – front	1.24	10.26
	Passenger trains	Front – end	0.65	5.13
		Front – front	1.29	10.26
	All combinations	Collision with no fatalities	0	0
Train object collision	Passenger train	Front-object	0.62	-
	Freight train	Front-object	0.66	3.86
	All combinations	Collision with no fatalities	0	0

Table 4-19 Accident scenarios for rail accidents and corresponding estimated average number of FWSI for passengers and employees

For comparison the data used in the risk assessment for the Øresund link ref. [13] shows that a derailment on average leads to between 0 and 5 fatalities, while an average fatality of 6 for front-front collisions involving a passenger train and an average fatality of 3 for front–end collision involving a passenger train.

4.4.2.2 **Disruption**

The disruption time given a collision and a derailment has been assessed based on available accident information. In the estimation it has been assumed that an accident leading to several fatalities will have a longer disruption time than an accident without any fatalities. However, it is assumed that an accident resulting in a fire or a toxic release will have a long disruption regardless of the number of fatalities.

4.4.2.2.1 **Derailments**

Clearing up after a non-severe derailment of a single wagon is estimated to take 4 to 6 hours, namely (ref. [14]):

- 1 hour for discovering the character of the problem,
- 2 hours for getting organized,
- 1 to 3 hours for doing the job.

4.4.2.2.2 Collisions

Clearing up after a train collision with no fatalities is estimated to take 6 hours on average, see ref. [14]. It is assumed to cover both collisions between trains and train collision with objects.

Rescuing and clearing up after railway accidents with fatalities are estimated to take 24 hours on average, ref. [14].

4.4.2.2.3 Disruption on road

For ordinary rail accidents that lead to fatalities on the rail, it is assessed that there will be a disruption on the road as well. This is due to the fact that the road tube will be used for evacuating passengers. The duration of the disruption on road depends on the severity of the accident; the assumed disruption lengths are presented in Table 4-20.

The disruptions are assessed in terms of six severity classes 1 to 6, where 1 corresponds to the shortest disruption time and 6 to the longest.

Disruption Class	Example	Disruption hours
1	Derailment of freight train with no fatalities	1
2	Derailment of passenger train with no fatalities	2
3	Front- end collision - freight trains	4
4	Front- end collision - passenger trains	6
5	Derailment/ Front-front collision passenger train with fatalities	8
6	Front-front collision freight trains	10

Table 4-20 Road disruption consequences caused by ordinary rail accidents

4.4.2.3 Repair costs due to ordinary rail accidents

Based on estimated repair cost for fires on road, costs for ordinary rail accidents have been estimated. It is assumed that a front- front collision with two passenger trains will damage the rail tunnel to the same extent as a fire on road with fire size between 20MW and 30MW. The other consequences have been assessed based on a comparison with the severity of front-front collision with two passenger trains. The repair costs are presented in Table 4-21 again represented with six consequence classes. It is underlined that the repair costs are only considering damage to the tunnel, and not the rolling stock etc.

Tunnel damage class	Example	million €
1	Derailment passenger train with no fatalities	0.01
2	Derailment freight trains with no fatalities	0.05
3	Front- end collision - no freight trains	0.1
4	Front- end collision - inv freight trains	0.5
5	Front-front collision passenger trains	1
6	Derailment/ Front-front collision with fatalities involving freight train	5
7	Explosion	500

Table 4-21 Consequences of repair costs for ordinary road and rail

4.4.3 Rail accidents involving dangerous goods

Similar to the modelling for the road a range of scenarios involving dangerous goods have been modelled on the railway part. These include:

- Ammonia release
- Chlorine release
- Flammable liquids
- LPG

Release of chlorine or ammonia in the rail tubes could be the result of an accident with a freight train.

When estimating the consequences of an accident leading to e.g. a toxic release, fatalities due to the "mechanical" accident (e.g. a collision) will not count as a fatality caused by dangerous goods. Only the additional fatalities, due to the actual presence of dangerous goods will be accounted as such.

4.4.3.1 **Ammonia release**

4.4.3.1.1 **Human impact**

The human impact due to an ammonia release on railway is similar to release on road, see section 4.3.2.

The number of fatalities depends on the number of people in the tunnel. As presented in section 9.1.3 medium release of ammonia gives a concentration of 40.000 ppm and the average odour threshold for ammonia is 5 ppm. This gives the train passengers between a half and one minute to evacuate to the adjacent rail tube or the road tube.

Based on the evacuation assessment made for fire where a pre-movement distribution of between 15 and 30 seconds (90% of occupants have 30 seconds pre-movement) and walking speed is 1.2m/s. The time it takes to evacuate the rail tube depends on the number of passengers. There are on average 95 passengers on a passenger train and based on the evacuation assessment for fire on rail it will take 1 minute and 50 seconds for 95 passengers to evacuate into the adjacent rail tube. It is assumed that after a collision or a derailment there might be additional difficulties because of already injured passengers and doors that do not open. It is therefore assessed that it will take 2 minutes to evacuate after a collision or a derailment.

The LC 50 (see appendix A in section 9) calculations show that 50% of the passengers will die because of the ammonia gas if they are exposed during more than 1 minute given the concentration of 40.000 ppm. It is assessed that 50% of the passengers will be able to evacuate in one minute and that 50% of the remaining 50% will be killed by the gas. This gives an additional 25% fatality probability from a medium release of ammonia. It is assumed that the additional fatality probability is 50% higher for a large release then for a medium release which gives a total 38% additional probability for fatalities after a large ammonia release. In Table 4-22 the result distributed on accident types is presented.

Accident type - Train(s) involved	Severity of accident		Estimated average number of employee FWSI	Estimated average number of passenger FWSI
Severe derailment - freight train carrying ammonia	Small		0	-
	Medium		0.35	-
	Large		0.53	-
Collision - Two freight trains one carrying ammonia	Front - end	Small	0	-
		Medium	0.70	-
		Large	1.05	-
	Front - front	Small	0	-
		Medium	0.70	-
		Large	1.05	-
Collision - Passenger train/ freight trains one carrying ammonia	Front - end	Small	0	0
		Medium	1.05	33.25
		Large	1.58	49.88
	Front - front	Small	0	0
		Medium	1.05	33.25
		Large	1.58	49.88
Train-object collision with freight train	Small release		0	-
	Medium release		0.35	-
	Large release		0.91	-

Table 4-22 Estimated FWSI as a consequence of a freight train accident resulting in release of ammonia in the railway tunnel

As presented in section 9.1.5.3 a small release gives no additional (to the fatalities due to the "mechanical" accident) fatalities, the number of fatalities in case of a small release is the same as an ordinary rail accident.

4.4.3.1.2 Disruption and Repair Cost

The disruption time and repair costs are assumed to be the same as for ordinary collisions. It is assumed that the cost for cleaning up after a toxic release is negligible compared to the repair cost after a collision, see Table 4-21. Disruption on rail is also estimated to be the same as for ordinary rail accidents, see Table 4-20.

4.4.3.2 Chlorine release

4.4.3.2.1 Human impact

The human impact due to an ammonia release on railway is similar to release on road, see section 4.3.2.

The number of fatalities depends on the number of people in the tunnel. As presented in section 9.1.3 medium release of chlorine gives a concentration of 40.000 ppm and the average odour threshold for chlorine is 0.2 ppm. This gives the train passengers between a half and one minute to evacuate to the adjacent rail tube or to the central gallery.

Since a concentration of 1.000 ppm can be fatal after a few deep breaths (se section 9.1.6.2) of the gas it is assessed that very few passengers will be able to evacuate into the adjacent rail tube before they are affected by the gas. In section 4.4.3.1.1 it was assumed that it will take a minimum of 1 minute to evacuate the train after the gas is detected. It is assessed that this is also the case after a release of chlorine it is therefore assessed that there will be an additional fatality rate of 50% which caused by medium chlorine release. In Table 4-23 the result distributed on accident types is presented. It is assumed that the additional fatality probability is 50% higher for a large release then for a medium release which gives a total 75% additional probability for fatalities after a large chlorine release.

Accident type - Train(s) involved	Severity of accident		Estimated average number of employee FWSI	Estimated average number of passenger FWSI
Severe derailmant - freight train carrying chlorine	Small		0.00	-
	Medium		0.70	-
	Large		1.05	-
Collision - Two freight trains one carrying chlorine	Front - end	Small	0.00	-
		Medium	1.40	-
		Large	2.31	-
	Front - front	Small	0.00	-
		Medium	1.40	-
		Large	2.10	-
Collision - Passenger train/ freight trains one carrying chlorine	Front - end	Small	0.00	0.00
		Medium	2.10	66.50
		Large	3.15	99.75
	Front - front	Small	0.00	0.00
		Medium	2.10	66.50
		Large	3.15	99.75
Train-object collision with freight train	Small release		0.00	-
	Medium release		0.70	-
	Large release		1.21	-

Table 4-23 Estimated FWSI as a consequence of a freight train accident resulting in release of chlorine in the railway tunnel

As presented in section 9.1.5.3, a small release gives no additional fatalities; the number of fatalities in case of a small release is the same as an ordinary rail accident.

4.4.3.2.2 Disruption and repair cost

The disruption time and repair costs are assumed to be the same as for ordinary collisions. It is assumed that the cost for cleaning up after a toxic release is negligible compared to the repair cost after a collision, see Table 4-21. Disruption on rail is also estimated to be the same as for ordinary rail accidents, see Table 4-20.

4.4.3.3 Corrosive release

4.4.3.3.1 Human impact

As described in section 9.1.4.1 it is assessed that there will not be any additional fatalities due to an accident with corrosive release is therefore estimated to be the same as for ordinary rail accidents involving freight trains.

4.4.3.3.2 Disruption and repair cost

The disruption time and repair costs are assumed to be the same as for ordinary collisions. It is assumed that the cost for cleaning up after a toxic release is negligible compared to the repair cost after a collision, see Table 4-21. Disruption on rail is also estimated to be the same as for ordinary rail accidents, see Table 4-20.

4.4.3.4 Explosions

As described in section 9.2 explosions caused by solid explosions, vapour cloud explosions and BLEVE are assumed to all give the same consequences; namely collapse of a single tunnel element. This is an assumption since an explosion may cause collapse of more than one element.

A collapse of one tunnel element due to an explosion in one tube will affect trains and vehicles in the accident tube as well as the other tubes. It is assumed that the accident occurs in the middle of the tunnel. All trains in the tube with the explosion and the adjacent rail tube are assumed to be affected as it is assumed, that the electrical systems will break down which means that the trains cannot drive out of the tunnel. It is conservatively assumed that the accident leads to a 95% fatality rate for both tunnel tubes.

In Section 4.1.2.1 is described the estimated distribution of number of persons in the railway tunnel.

Estimated repair time is assumed about one year. The entire tunnel has to be closed for traffic for the repair time. The repair cost is estimated to €500 million.

4.4.4 Modelling of dangerous goods restrictions

As described in ref. [1], the following restrictions will apply for dangerous goods transported on railway:

- Freight trains with RID-classified goods are only allowed in the tunnel, if there are no passenger trains at the same track.
- Freight trains with dangerous goods classified as RID class 1 or RID class 1.5 or 1.6 are only allowed in the tunnel, when no other trains are in the tunnel, irrespective of tunnel tube.
- Freight wagons with dangerous goods classified as RID class 1 are only allowed to transport 1000 kg explosive goods per train wagon.

The following general events will be affected by at least one of the restrictions:

- Freight trains with RID-classified goods are only allowed in the tunnel, if there are no passenger trains at the same track.
    - Collisions between passenger trains and freight trains carryings dangerous goods will have their frequency set to 0.
    - No passengers will be present in the same tube
- Freight trains with dangerous goods classified as RID class 1 or RID class 1.5 or 1.6 are only allowed in the tunnel, when no other trains are in the tunnel, irrespective of tunnel tube.
    - All train-train collision scenarios involving freight trains carrying explosives will have their frequency set to 0.
    - The consequences of derailment and train-object collision scenarios involving freight trains carrying explosives will be modified such that only fatalities among employees on the freight train and road users are possible.
- Freight wagons with dangerous goods classified as RID class 1 are only allowed to transport 1000 kg explosive goods per train wagon.
    - This will not significantly affect the model in its current form, because it is assessed that even 1000 kg of explosives will have a very large impact on the tunnel structure and the persons inside the tunnel.

4.4.5 Fire – Rail

Detailed fire modelling has been carried out in order to establish the fire strategy, see ref. [16]. The fire modelling provides consequence inputs to the event trees for fire on:

- Passenger trains
- Freight trains
- Fire in trains carrying dangerous goods

For the passenger train and freight trains four different locations of the fire have been assumed:

- Interior of train wagon
- Under wagon
- In engine
- In roof

A probability for each of the fire locations has been assessed, namely interior (5%), engine (40%), roof (40%) and under train wagon (15%).

Evacuation analyses have been carried out for all the fire scenarios, see ref. [16]. The tenability criteria chosen are similar as those for the road analyses, as described in section 4.3.3.1.1.

In general these analyses show that when there is average number of passengers on the train (95 persons) the evacuation is efficient with little queuing. The same holds if there are 200 passengers on the train. If the maximum capacity is used (here assumed to be 588 passengers) passengers will queue up at the exits and this will lead to a number of FWSI. A distribution for the number of passenger has been proposed in appendix in C in section11; however, using the distribution (a lognormal) the probability of having more than e.g. 350 passengers or more on a train is less than 10^{-7}. In order to ensure conservative estimates, the following assumptions are made:

- The number of fatalities on a train with 350 passengers is assumed to be the same as the number of fatalities calculated on basis on a full train with 320 passengers.
- The probability of having 350 passengers or more is assumed to be 0.1%

4.4.5.1 **Disruption and repair costs due to fires, enclosed tunnel**

All fire scenarios lead to a fire of a certain peak fire size, measured in MW (Megawatt). In the consequence modelling, it assessed that for each peak fire size there are certain consequences in terms of disruption as well as repair costs. Two factors are important when comparing consequences of fires in the road and rail part:

- Due to the fact that the train tube is smaller than the road tube, fires are expected to be more intense and damage a longer section of tunnel.
- Compared to road, restoring the rail tunnel after a fire will probably be more costly and time consuming, due to strict validation and verification procedures in railway projects, and because it is a more difficult and restricted working environment.

Due to these facts it is assumed that disruption time as well as repair costs are 50% higher than for a similar fire in the road tube part. The results, i.e., assumed disruption time and repair costs in the railway tube, are shown in Table 4-24.

Fire size [MW]	Mean repair cost [Euro]	Mean disruption, incident tube [days]	Mean disruption, other tubes (non-incident tubes) [hours]
1	2.250,00	0.3	1
2.5	14.062,50	0.6	3
8	144.000,00	0.9	6
15	506.250,00	1.5	9
20	900.000,00	6	12
30	2.025.000,00	10.5	18 (0.75 day)
50	22.500.000,00	45	126 (5.25 day)
200	90.000.000,00	135	252 (10.5 days)
350	157.500.000,00	135	252 (10.5 days)

Table 4-24 Assessed repair cost and disruption length for a range of fire sizes in enclosed tunnel

4.4.5.2 **Disruption and repair costs due to fires, land sides**

On landsides, fires are assessed not to lead to fatalities due to the possibility for escaping from the fire. Fires on landsides will, however, lead to disruption and to repair costs.

In general the repair costs and the disruption time will be much smaller if the fire is located on the landsides comparing with consequences of fire in the enclosed tunnel part. This is primarily due to that the amount of equipment is much larger in the enclosed tunnel part and that the tunnel structure is not damaged by a fire on the land sides.

Based on Table 4-24 disruption lengths and repair costs are assessed for a range of selected fire sizes relevant for the fire modelling on the land side; the result can be seen in Table 4-25. In general it is assumed that the repair costs for fires on landsides are 1/10 of the repair costs for a similar fire in the enclosed tunnel part. For the same reasons the disruption time is much lower for fires on the land sides. A fire on e.g. the rail part of a land side is assumed not to have any impact on disruption of the road part, and vice versa.

Fire size [MW]	Mean repair cost [Euro]	Mean disruption, incident "tube" [days]
1	225	0.3
2.5	1406	0.6
15	50625	0.75
30	202500	2.25
200	9000000	3
350	15750000	3

Table 4-25 Assessed repair cost and disruption length for a range of fire sizes on the land sides

4.5 External events

The consequences of the external events are presented in the following sections.

4.5.1 Flooding

Due to predictions and forecasts flooding is very unlikely to cause any fatalities. The tunnel will simply in these cases be shut down, causing a disruption.

4.5.1.1 Heavy rainfall

The tunnel has been designed for heavy rainfall, but not for extreme rain events, which are expected to occur on average every 50 years. In these cases it is assumed that:

- It will take a long time to fill the drainage system; the pumps will continuously try to empty the drain during the rainfall.
- Only in cases where the pumping capacity is too small or is not properly functioning, the drainage system can be filled.
- Also an alarm shall appear in the tunnel SCADA if the drainage system is in a position which implies a risk for water on the rail tracks.
- In those cases water can start to fill the tunnel.
- However, the water level should be very high before it has consequences in terms of repair costs – such a rainfall is assessed not to occur in reality.

Hence, it is assessed that every 50 years the complete tunnel will be disrupted during such a rainfall event – conservatively, this disruption is estimated at 6 hours.

4.5.1.2 High water level

The tunnel has been designed to resist a very high water level - see ref. [15]. Taking into account that flood protection will be installed whenever the water level is too high, water is prevented from entering the tunnel. In the very rare event of a mean water level higher than 4.6m above normal water level together with a worst case rainstorm event and global warming, water will begin to flow into the tunnel. In this very unlikely event Lolland will be completely flooded, and it will not be possible to get to the link from the Lolland side.

Again, as with heavy rainfall, the consequences are a disruption of the complete link. The event is estimated to occur with a frequency of $3.0 \cdot 10^{-5}$ in 2025 (and similarly with a frequency in 2045 of about $5.0 \cdot 10^{-5}$). In ref. [22] the consequence of flooding the substation is estimated to be a disruption up to 12 month.

4.5.2 Sunken ship on tunnel

A sinking ship hitting the tunnel roof will cause a dynamic load during impact and subsequently a static load originating from the weight of the ship. The Fehmarnbelt Fixed Link design load is 150 KN/m^2. The impact force *F* on the tunnel roof from a sinking ship is determined as $F=m \cdot g$, where *m* is the ship displacement and *g* is the gravitation.

It is assumed that the sinking ships will affect the tunnel in the same way regardless of how the ship hits the tunnel roof, and that any ship with a load higher than the design load will cause the tunnel to collapse.

The data that has been used to establish the frequency for sinking ships includes ship displacement, length and ship width ref. [9].

It has been assumed that the ships loads are distributed on 10% of the ships' area when it hits the tunnel. This is likely a conservative assumption.

Calculations based on evaluation of impact forces and tunnel capacity results in that 0.4% of all impact on the tunnel from sinking ships lead to a collapse of the tunnel, i.e. the collapse frequency is $1.6 \cdot 10^{-7}$ in 2025 and $2.7 \cdot 10^{-7}$ in 2045.

It is assumed that a collapse of the tunnel due to a sunken ship affects the people in the tunnel in the same way as an explosion, which implies that the following assumptions are made:

- A sunken ship beyond design load cause collapse of one element
- A collapse of one tunnel element will affect vehicles in all tubes
- The ship hits the middle of the tunnel
- Vehicles which just have passed the collapsing element are assumed to be able to drive out of the tunnel
- All train in the tunnel will be affected by the collapse

Calculations for explosion show that a collapse of the tunnel will lead to 215 fatalities on average on road and 17.4 fatalities or 19.4 FWSI on rail.

Estimated repair time is assumed to be about one year, where the entire tunnel has to be closed for traffic during the repairing period. The repair cost given such an accident is estimated to 500 million Euros.

4.5.3 Fire in transformer room

There are 10 transformer rooms in connection to the road tunnel and 10 transformer rooms in connection to the rail tunnel. In each transformer room there are 2 transformers.

Substations will be placed in the tunnel at the location of each special element containing transformers, switchgear and distribution boards. Each of the substations will be equipped with redundant switchgear and transformers. There is a gaseous suppression fire fighting system in each of the substations. Each room will be separated by firewalls and escape doors.

Since the transformer rooms will be separated by fire walls it is assumed that fire in a transformer room will not cause any fatalities.

The following assumptions have been used:

- The fire suppression system does not affect the transformers in a way that could lead to a longer disruption time.
- One functioning transformer per transformer room is assumed sufficient to stay in operation.
- Since there are redundant transformers and switchgear, there will be no disruption caused be power failure due to fire in a transformer room.

- The gaseous suppression will suppress the fire before the other transformer in the room is affected.
- In case of a fire in a transformer room there will be an average disruption of 1 hour in the tube where the transformer room is located in order to inspect the consequences of the fire.

The estimated cost for fire in transformer room is assumed to be €1.500 if suppression works (90%) and €150.000 if the suppression system does not work (10%).

It is assumed that there will be one metre between every vehicle. The calculations show that there will be on average 26 people trapped between the two fires and it is conservatively assumed that they will be fatally injured.

4.5.4 Dragged and dropped anchor

In this section the consequences in terms of fatalities and disruption of the tunnel due to dragged and dropped anchors are presented.

In the frequency assessment the initial event frequency is to be calculated in the nearest future, and the results of the calculations are expected to be included in the Operational Risk Analysis within the autumn 2014 revision.

The frequencies cover all types of accidents related to dragged and dropped anchors. The following two types of cases are considered:

- No damage or minor anchor damage to the tunnel and the protection layer
- Critical damage to the protection layer and the tunnel roof

The people that have just passed the accident location will drive out of the tunnel and the people approaching the accident location will be fatally injured. Based on calculations made for explosions it is assessed that there will be 215 fatalities on road and 17.4 fatalities or 19.4 FWSI on rail.

These calculations have also been used for sunken ship on tunnel. There will be 365 disruption days on both road and rail and it will cost €500 million to repair the tunnel.

4.5.5 Grounding ships

The ship grounding frequencies covers all types of groundings. In the following two types of groundings are considered:

- Groundings leading to no damage or minor damage to the tunnel and the protection layer
- Serious grounding leading to critical damage to the protection layer and the tunnel roof

For groundings giving minor damages the grounding ship will simply slide on the seabed and will not penetrate the seabed and the protection layer. Hence, there will be no fatalities amongst the tunnel users. However, the grounding in itself will lead to a stop in the tunnel operation during a period while it is investigated whether or not the grounding ship has damaged the tunnel roof after all. It is assumed that the disruption period will be approximately one day.
Ship size 1 to 5 is not assumed to cause any greater damage to the tunnel in case of grounding. Only ship size 6 - 9 is assumed to provide serious damage by grounding.

For critical damage, the draught of the grounding ship must significantly exceed the water depth leading to a penetration of the protection layer and leading to serious tunnel roof damages and water ingress into the tunnel. It is assumed that the structural damage solely affects one tunnel tube.

It is assumed that the grounding will take place in coastal areas and that the water inflow into the tunnel tube will affect all persons in the tunnel tube. Further, it is conservatively assumed that the disruption is a total disruption covering all tunnel tubes.

It is conservatively assessed that a grounding leading to a tunnel collapse will affect the people in the tunnel in the same way as an explosion in the end or beginning of the tunnel, see section 4.3.2.4.

In the explosions calculations it is assumed that vehicles in the road tubes that have just passed the accident location will drive out of the tunnel and the vehicles approaching the accident location will be affected by the accident. All trains in the tunnel will be affected by the accident.

In Section 4.1.2.1 is described the estimated distribution of number of persons in the railway tunnel.

It is assessed that there will be 365 days of disruption on both road and rail and it will cost €500 million to repair the tunnel.

4.6 Multiple simultaneous events

As no simultaneous events for rail are subject to detailed frequency calculation, no consequences are found for multiple simultaneous events for rail.

It is assessed that disruption and repair costs is included in the assessment of fire and toxic release on road and this section only include a consequence assessment in regard to fatalities.

The consequence that is assessed in this section is the consequences of multiple simultaneous events that could lead to persons being trapped in an area with smoke or toxic gas. In this context a toxic release has the same properties as smoke from a fire, but will not be covered in this analysis since a combination of these events is highly unlikely. It is assessed that it will contribute very little to the total number of fatalities per year on The Fehmarnbelt Fixed Link.

In the assessment it is assumed that the only scenario that is not included in the fire assessment is the scenario where two fires occur within 100 meters from each other where the emergency exits will be blocked. The fire frequencies for the entire fixed link have been scaled to the 100 meters in this assessment and are presented in Table 4-26.

Yearly frequency	
2025	$8.18 \cdot 10^{-8}$
2045	$1.90 \cdot 10^{-7}$

Table 4-26 Scaled yearly fire frequency

In order to estimate the number of persons exposed, the number of vehicles within 100 m must be assessed. The estimated vehicle lengths are presented in Table 4-27.

Vehicles in a queue	Vehicle length [m]
Cars	4.75
Buses	16.5
Lorries	13.7

Table 4-27 Vehicle length

5. RISK

In this section the risk is presented for all scenarios. The risk is calculated by multiplying the frequencies and the consequences:

$$Risk = frequency \cdot consequence$$

The risk is calculated and presented in terms of annual expected fatalities on road and rail, annual expected disruption days on road and rail and annual expected repair costs.

5.1 Ordinary road

The risk of ordinary road accidents in terms of fatalities, disruption and repair costs are presented in Table 5-1.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	$1.6 \cdot 10^{-1}$	0	0	$2.5 \cdot 10^{-1}$	0	0	$1.6 \cdot 10^{4}$
2045	$1.3 \cdot 10^{-1}$	0	0	$2.9 \cdot 10^{-1}$	0	0	$1.9 \cdot 10^{4}$

Table 5-1 Risk of ordinary road accidents in terms of fatalities, FWSI, disruption and repair costs

From Table 5-1 it is seen that there will be no fatalities or disruption on rail caused by ordinary road accidents. Note that dangerous goods accidents are not included here.

5.2 Road accidents involving dangerous goods

In Table 5-2 the results for accidents involving dangerous goods are presented (ordinary road accidents not including dangerous goods are excluded).

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	$2.3 \cdot 10^{-3}$	$1.1 \cdot 10^{-4}$	$5.8 \cdot 10^{-6}$	$1.0 \cdot 10^{-3}$	0	$1.7 \cdot 10^{-3}$	$1.8 \cdot 10^{3}$
2045	$3.5 \cdot 10^{-3}$	$1.1 \cdot 10^{-4}$	$5.8 \cdot 10^{-6}$	$1.2 \cdot 10^{-3}$	0	$2.0 \cdot 10^{-3}$	$2.1 \cdot 10^{3}$

Table 5-2 Risk from accidents involving dangerous goods on road in terms of fatalities, FWSI, disruption and repair costs

5.3 All road accidents

In Table 5-3 the results for road accidents - ordinary road accidents and road accident involving dangerous goods are presented.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	$1.7 \cdot 10^{-1}$	0	0	$2.5 \cdot 10^{-1}$	0	$1.7 \cdot 10^{-3}$	$1.8 \cdot 10^{-4}$
2045	$1.3 \cdot 10^{-1}$	0	0	$2.9 \cdot 10^{-1}$	0	$2.0 \cdot 10^{-3}$	$2.1 \cdot 10^{-4}$

Table 5-3 Risk from all road accidents in terms of fatalities, FWSI, disruption and repair costs

5.4 Fire (road)

5.4.1 Results for fire in road part, enclosed tunnel

The risk of fires in the tunnel road part in terms of fatalities, disruption and repair costs are presented in Table 5-4.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	$9.6 \cdot 10^{-5}$	0	0	$2.7 \cdot 10^{-1}$	0	$5.0 \cdot 10^{-2}$	$5.0 \cdot 10^{4}$
2045	$2.1 \cdot 10^{-4}$	0	0	$5.1 \cdot 10^{-1}$	0	$9.1 \cdot 10^{-2}$	$1.1 \cdot 10^{5}$

Table 5-4 Risk of fires in the enclosed tunnel road part in terms of fatalities, FWSI, disruption and repair costs

From Table 5-4 it is seen that the disruption on the rail is caused by the fire on road and therefore determines a simultaneous disruption of road and rail of 0.04 days in 2025 and 0.07 days in 2045.

5.4.2 Results for fire in road part, landsides

The results of fires on landsides are presented in Table 5-5.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	0	0	0	$8.6 \cdot 10^{-2}$	0	0	$5.1 \cdot 10^{4}$
2045	0	0	0	$1.5 \cdot 10^{-1}$	0	0	$1.1 \cdot 10^{5}$

Table 5-5 Risk of fires in the road part of the land sides in terms of fatalities, FWSI, disruption and repair costs

It is seen that fires on the road part of the landsides are neither expected to lead to fatalities, nor disruption of the railway part.

5.5 Results – landsides and enclosed tunnel

The summarized results for the landsides and the enclosed tunnel are presented in Table 5-6.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	$9.6 \cdot 10^{-5}$	0	0	$3.5 \cdot 10^{-1}$	0	$5.0 \cdot 10^{-2}$	$1.0 \cdot 10^{5}$
2045	$2.1 \cdot 10^{-4}$	0	0	$6.6 \cdot 10^{-1}$	0	$9.1 \cdot 10^{-2}$	$2.2 \cdot 10^{5}$

Table 5-6 Risk of fire in the road part of the total scope (landsides and enclosed tunnel) in terms of fatalities, FWSI, disruption and repair costs

It is seen that fires in the road part leads to about 0.3 days disruption of the road part (in 2025). Here it is conservatively not taken into account that it probably will be possible to use the other road for traffic in both directions, not by means of bi-directional traffic, but by shifting the traffic direction e.g. every hour.

Looking at the disruption time for the different fire sizes, by joining the results in Table 4-16 and Table 5-4 for the enclosed tunnel part, and Table 4-17 and Table 5-5 for the landsides part, the results per fire size can be obtained. From this it is seen that about 20% of the disruption time originates from fires with a size of 50 MW or more, i.e., very large fires that results in a long disruption time. Subtracting the disruption time originating from very large fires, the average disruption time for road in 2025 is considerably less than 0.4 days per year.

5.6 Ordinary rail

The results from ordinary rail accidents, i.e. derailments and collision are presented in the next section.

5.6.1 Results ordinary rail

The consequences of ordinary rail in terms of fatalities, disruption and repair costs are presented in this section, not including accidents involving dangerous goods (these are presented in the following sections). In Table 5-7 the risk of derailments are presented.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	0	$1.8\cdot10^{-4}$	$1.6\cdot10^{-4}$	0	$6.6\cdot10^{-4}$	$8.6\cdot10^{-4}$	$2.0\cdot10^{2}$
2045	0	$1.8\cdot10^{-4}$	$2.4\cdot10^{-4}$	0	$1.0\cdot10^{-3}$	$1.3\cdot10^{-3}$	$2.9\cdot10^{2}$

Table 5-7 Risk of derailments in terms of fatalities, FWSI, disruption and repair costs

In Table 5-8 the risk of collisions between trains are presented.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	0	$1.3\cdot10^{-3}$	$2.9\cdot10^{-4}$	0	$4.2\cdot10^{-4}$	$2.5\cdot10^{-4}$	$3.7\cdot10^{2}$
2045	0	$1.3\cdot10^{-3}$	$3.9\cdot10^{-4}$	0	$5.1\cdot10^{-4}$	$3.4\cdot10^{-4}$	$5.2\cdot10^{2}$

Table 5-8 Risk of collisions between trains in terms of fatalities, FWSI, disruption and repair costs

In Table 5-9 the risk of train-object collisions are presented.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	$1.7\cdot10^{-6}$	$5.1\cdot10^{-4}$	$2.6\cdot10^{-4}$	0	$3.4\cdot10^{-4}$	$3.3\cdot10^{-4}$	$1.9\cdot10^{2}$
2045	$2.7\cdot10^{-6}$	$5.1\cdot10^{-4}$	$3.6\cdot10^{-4}$	0	$4.7\cdot10^{-4}$	$4.4\cdot10^{-4}$	$2.8\cdot10^{2}$

Table 5-9 Risk of train-object collisions in terms of fatalities, FWSI, disruption and repair costs

From Table 5-7, Table 5-8 and Table 5-9 it is seen that there will be no fatalities or disruption of the road part alone caused by ordinary rail accidents.

5.6.2 Rail accidents involving dangerous goods

In Table 5-10 the results from the consequence assessment for rail are presented.

	Road - fat	Rail - FWSI Pass	Employees	Disruption [days] Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	$7.4 \cdot 10^{-6}$	$1.4 \cdot 10^{-6}$	$1.4 \cdot 10^{-7}$	0	$2.2 \cdot 10^{-4}$	$7.0 \cdot 10^{-5}$	$4.6 \cdot 10^{2}$
2045	$1.1 \cdot 10^{-5}$	$1.7 \cdot 10^{-6}$	$2.0 \cdot 10^{-7}$	0	$3.1 \cdot 10^{-4}$	$1.0 \cdot 10^{-4}$	$6.8 \cdot 10^{2}$

Table 5-10 Risk from collisions and derailments involving dangerous goods on rail in terms of fatalities, FWSI, disruption and repair costs

The injuries and fatalities in the road part caused by dangerous goods events in the railway part are considered as "others".

5.7 Fire (rail)

5.7.1 Results for fire in railway part, enclosed tunnel

The risk of fires in the enclosed tunnel rail part in terms of fatalities, disruption and repair costs are presented in Table 5-11.

	Road - fat	Rail - FWSI Pass	Employees	Disruption [days] Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	0	$5.2 \cdot 10^{-5}$	$1.1 \cdot 10^{-6}$	$8.6 \cdot 10^{-4}$	$8.4 \cdot 10^{-3}$	$8.6 \cdot 10^{-4}$	$1.6 \cdot 10^{3}$
2045	0	$5.2 \cdot 10^{-5}$	$1.1 \cdot 10^{-6}$	$9.8 \cdot 10^{-4}$	$9.8 \cdot 10^{-3}$	$9.8 \cdot 10^{-4}$	$1.8 \cdot 10^{3}$

Table 5-11 Risk of fires in the enclosed tunnel rail part in terms of fatalities, FWSI, disruption and repair costs

From Table 5-11 it is seen that disruption on the road part can be caused by a fire on rail and therefore determines a simultaneous disruption of road and rail of 0.015 days in 2025 and 0.028 days in 2045.

5.7.2 Results for fire in railway part, landsides

The risks of fires on landsides are presented in Table 5-12.

	Road - fat	Rail - FWSI Pass	Employees	Disruption [days] Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	0	0	0	0	$9.2 \cdot 10^{-2}$	0	$3.0 \cdot 10^{4}$
2045	0	0	0	0	$9.6 \cdot 10^{-2}$	0	$8.4 \cdot 10^{3}$

Table 5-12 Risk of fires in the landsides rail part in terms of fatalities, FWSI, disruption and repair costs

It is seen that fires on the rail part of the landsides are neither expected to lead to fatalities, nor disruption of the road part. It is seen to lead to a yearly average disruption of the railway of about 3.8 days per year in 2045.

5.7.3 Results for fire in railway part, landsides and enclosed tunnel

The summarized results for the landsides and the enclosed tunnel are presented in Table 5-13.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	0	$5.2 \cdot 10^{-5}$	$1.1 \cdot 10^{-6}$	$8.6 \cdot 10^{-4}$	$1.0 \cdot 10^{-1}$	$8.6 \cdot 10^{-4}$	$3.2 \cdot 10^{4}$
2045	0	$5.2 \cdot 10^{-5}$	$1.1 \cdot 10^{-6}$	$9.8 \cdot 10^{-4}$	$1.1 \cdot 10^{-1}$	$9.8 \cdot 10^{-4}$	$1.0 \cdot 10^{4}$

Table 5-13 Risk of fire in the road part of the total scope (landsides and enclosed tunnel) in terms of fatalities, FWSI, disruption and repair costs

5.8 External events

In the following sections the risk for the external events are presented.

5.8.1 Flooding

The risk of flooding in terms of fatalities, disruption and repair costs are presented in Table 5-14.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	0	0	0	0	0	$3.4 \cdot 10^{-1}$	0
2045	0	0	0	0	0	$3.4 \cdot 10^{-1}$	0

Table 5-14 Risk of flooding in terms of yearly average fatalities, FWSI, disruption and repair costs

5.8.2 Sunken ship on tunnel

The risk of sunken ship on tunnel in terms of fatalities, disruption and repair costs are presented in Table 5-15.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	$3.5 \cdot 10^{-5}$	0	0	0	0	$5.9 \cdot 10^{-5}$	$8.1 \cdot 10^{1}$
2045	$5.9 \cdot 10^{-5}$	0	0	0	0	$1.0 \cdot 10^{-4}$	$1.4 \cdot 10^{2}$

Table 5-15 Risk of sunken ship on tunnel in terms of yearly average fatalities, FWSI, disruption and repair costs

5.8.3 Dragged and dropped anchor

The risk of dragged and dropped anchor in terms of fatalities, disruption and repair costs are presented in Table 5-16.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	$3.5 \cdot 10^{-7}$	$5.0 \cdot 10^{-8}$	$2.7 \cdot 10^{-9}$	0	0	$4.3 \cdot 10^{-7}$	$1.5 \cdot 10^{0}$
2045	$5.9 \cdot 10^{-7}$	$8.3 \cdot 10^{-8}$	$4.6 \cdot 10^{-9}$	0	0	$7.1 \cdot 10^{-7}$	$2.5 \cdot 10^{0}$

Table 5-16 Yearly average risk due to dropped and dragged anchor in terms of fatalities, FWSI, disruption and repair costs

5.8.4 Grounding ship

The risk of grounding ships in terms of fatalities, disruption and repair costs are presented in Table 5-17.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	$4.4 \cdot 10^{-6}$	$6.2 \cdot 10^{-7}$	$3.4 \cdot 10^{-8}$	0	0	$7.4 \cdot 10^{-6}$	$1.0 \cdot 10^{1}$
2045	$7.3 \cdot 10^{-6}$	$1.0 \cdot 10^{-6}$	$5.7 \cdot 10^{-8}$	0	0	$1.2 \cdot 10^{-5}$	$1.7 \cdot 10^{1}$

Table 5-17 Risk due to ship groundings on tunnel roof in terms of fatalities, FWSI, disruption and repair costs

5.8.5 Fire in transformer room

The risk of fire in transformer room in terms of fatalities, disruption and repair costs are presented in Table 5-18. From Table 5-18 it is seen that there will be no fatalities on rail or road caused by fire in transformer room.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	0	0	0	0	0	$1.7 \cdot 10^{-3}$	$2.1 \cdot 10^{1}$
2045	0	0	0	0	0	$1.7 \cdot 10^{-3}$	$2.1 \cdot 10^{1}$

Table 5-18 Risk of fire in transformer room in terms of fatalities, FWSI, disruption and repair costs

5.8.6 Multiple simultaneous events

In the multiple event scenarios it has been assessed that only the scenario with two fires very close to each other could lead to fatalities.

		Rail - FWSI		Disruption [days]			
	Road - fat	Pass	Employees	Road [alone]	Rail [alone]	Simultaneous	Repair cost [euro]
2025	$2.0 \cdot 10^{-6}$	0	0	*	*	*	*
2045	$4.6 \cdot 10^{-6}$	0	0	*	*	*	*

Table 5-19 Risk of two fires in terms of fatalities, FWSI, disruption and repair costs

*Disruption and repair costs are assessed under fire, toxic releases and traffic accident respectively.

5.8.7 Qualitative assessments of maintenance operations

In general there has been focus on developing a tunnel design that ensures optimal conditions for workers and maintenance personnel.

The whole maintenance strategy and philosophy has been described in detail in ref. [20]. Some main points regarding safety are:

- A significantly part of the maintenance work is located in the special elements
- Maintenance workers may park the car in separate lay-by in the special elements - hence no parking is done in e.g. emergency lane.
- The worker can go directly to the service rooms from the lay-by
- In order to get controlled access to the other side of the tubes, the worker can use a channel located under the road – hence the worker does not have to pass the road with traffic.
- All installation rooms have two separate doors to ensure the possibility for safe escape

Hence, no maintenance workers are expected to be harmed due to maintenance work in the tunnel and landsides.

6. RESULTS

6.1 Acceptance criteria

The calculated risk acceptance criteria are presented in Table 6-1.

Risk Acceptance Criteria	2025	2045
Risk to road users (FAT/year)	0.223	0.174
Risk to rail passengers (FWSI/year)	$3.09 \cdot 10^{-3}$	$3.09 \cdot 10^{-3}$
Risk to rail employees (FWSI/year)	$1.09 \cdot 10^{-2}$	$1.49 \cdot 10^{-2}$
Risk to level crossing users (FWSI/year)	-	-
Risk to others (FWSI/year)	$3.67 \cdot 10^{-3}$	$4.98 \cdot 10^{-3}$
Risk to unauthorized persons on premises (FWSI/year)	0.136	0.185
Third party risk (FWSI/year)	To be updated autumn 2014	
Societal risk (FAT/year)	To be updated autumn 2014	
Risk of disruption to road (days/year)	6.5	6.5
Risk of disruption to rail (days/year)	0.6	0.6
Risk of simultaneous disruption (days/year)	0.6	0.6
Environmental risk (Euro/year)	-	-

Table 6-1 Risk acceptance criteria

The simultaneous disruption for road and rail is bounded by the acceptance criterion on the disruption of the railway, which is estimated to 0.6 days.

6.2 Individual risk

The overall risk for the individual risk on road and rail is presented in Table 6-2.

Fatalities/FWSI	2025	2045
	Per year	Per year
Fatalities road	0.165	0.131
FWSI rail passengers	$2.60 \cdot 10^{-3}$	$2.78 \cdot 10^{-3}$
FWSI rail employees	$8.81 \cdot 10^{-4}$	$1.22 \cdot 10^{-3}$

Table 6-2 Individual risk

Comparing the acceptance criteria presented in Table 6-1 with the estimated risk Table 6-2, it is seen that the individual risk is acceptable for both road and rail.

	Percentage of acceptance criteria	
Year	2025	2045
Fatalities road	74.0%	75.1%
FWSI rail passengers	84.2%	90.0%
FWSI rail employees	8.0%	8.2%

Table 6-3 Calculated risk in percentages of the acceptance criteria

In Table 6-4 the calculated risk for "others" and the percentages of the acceptance criteria is shown. It is seen that the risk for "others" is acceptable.

	"Other" FWSI	Percentage of acceptance criteria
2025	$1.15 \cdot 10^{-5}$	0.31%
2045	$1.72 \cdot 10^{-5}$	0.35%

Table 6-4 Calculated risk for "others" (fatalities per year) and percentages of the acceptance criteria

The contributors to fatalities on road for 2025 are shown in Table 6-5.

Fatalities on road	Fatalities per year in 2025	Percentage
Ordinary road	$1.63 \cdot 10^{-1}$	98.55%
Fire	$9.58 \cdot 10^{-5}$	0.06%
Dangerous goods - road	$2.25 \cdot 10^{-3}$	1.36%
Dangerous goods - rail	$7.42 \cdot 10^{-6}$	0.004%
External events	$4.15 \cdot 10^{-5}$	0.03%
Total	**$1.65 \cdot 10^{-1}$**	**100%**

Table 6-5 Contributors to fatalities per year on road in 2025

It is seen that ordinary road accidents constitute the most significant risk of fatalities on the road with a minor contribution from dangerous goods. Fire and external events contribute very little to the total number of fatalities.

The contributors to passenger fatalities on rail for 2025 are shown in Table 6-6.

Fatalities on rail	Fatalities per year in 2025	Percentage
Ordinary rail	$1.74E \cdot 10^{-3}$	93.70%
Fire	$3.69 \cdot 10^{-5}$	1.99%
Dangerous goods - rail	$9.82 \cdot 10^{-7}$	0.05%
Dangerous goods - road	$7.51 \cdot 10^{-5}$	4.04%
External events	$4.01 \cdot 10^{-6}$	0.22%
Total	**$1.86 \cdot 10^{-3}$**	**100%**

Table 6-6 Contributors to passenger fatalities per year on rail in 2025

The contributors to employee fatalities on rail for 2025 are shown in Table 6-7.

Fatalities on rail	Fatalities per year in 2025	Percentage
Ordinary rail	$6.24 \cdot 10^{-4}$	99.09%
Fire	$7.76 \cdot 10^{-7}$	0.12%
Dangerous goods - rail	$9.51 \cdot 10^{-8}$	0.02%
Dangerous goods - road	$4.12 \cdot 10^{-6}$	0.65%
External events	$7.63 \cdot 10^{-7}$	0.12%
Total	**$6.30 \cdot 10^{-4}$**	**100%**

Table 6-7 Contributors to employee fatalities per year on rail in 2025

It is seen that ordinary rail accidents constitutes the most significant risk of fatalities on the rail, with a smaller contribution from dangerous goods. Fire contributes about 1.99% of the fatalities. Dangerous goods contribute about 4% in total, with the large part originating from dangerous goods accidents in the road part.

In Table 6-8 it is shown how collisions, derailments and train-object collisions contribute to the total risk on rail for ordinary rail accidents.

Fatalities on rail	Fatalities per year in 2025	Percentage
Derailments	$1.28 \cdot 10^{-4}$	7.34%
Trains collisions	$1.25 \cdot 10^{-3}$	71.84%
Collision with objects	$3.62 \cdot 10^{-4}$	20.82%
Ordinary rail	**$1.74 \cdot 10^{-3}$**	**100%**

Table 6-8 Contributors to fatalities per year on rail in 2025 for ordinary rail accidents

It is seen that 71.8% of the fatalities on rail are due to train collisions.

6.3 Societal risk

Section to be updated during autumn 2014.

6.4 Disruption risk

In the following section the disruption risk for road, rail and simultaneous disruption is presented.

6.4.1 Disruption road

The total number of disruption days per year for road and the contributing factors for 2025 are seen in Table 6-9. It is seen that fire (road and rail) contributes most (40.4%), while external events and ordinary road accidents also give significant contributions with 34% and 25.2% respectively.

Disruption road	Contribution	Percentage
Ordinary road	$2.51 \cdot 10^{-1}$	25.20%
Ordinary rail	$1.43 \cdot 10^{-3}$	0.14%
Fire, road	$4.01 \cdot 10^{-1}$	40.30%
Fire, rail	$5.33 \cdot 10^{-4}$	0.05%
Dangerous goods – road	$2.72 \cdot 10^{-3}$	0.27%
Dangerous goods – rail	$7.30 \cdot 10^{-5}$	0.007%
External events	$3.39 \cdot 10^{-1}$	34.03%
Total	$\mathbf{9.96 \cdot 10^{-1}}$	**100%**

Table 6-9 Total number of disruption days for road and the contributing factors (2025)

An FN-curve for the disruption of the road part for 2025 is shown in Figure 6-1.

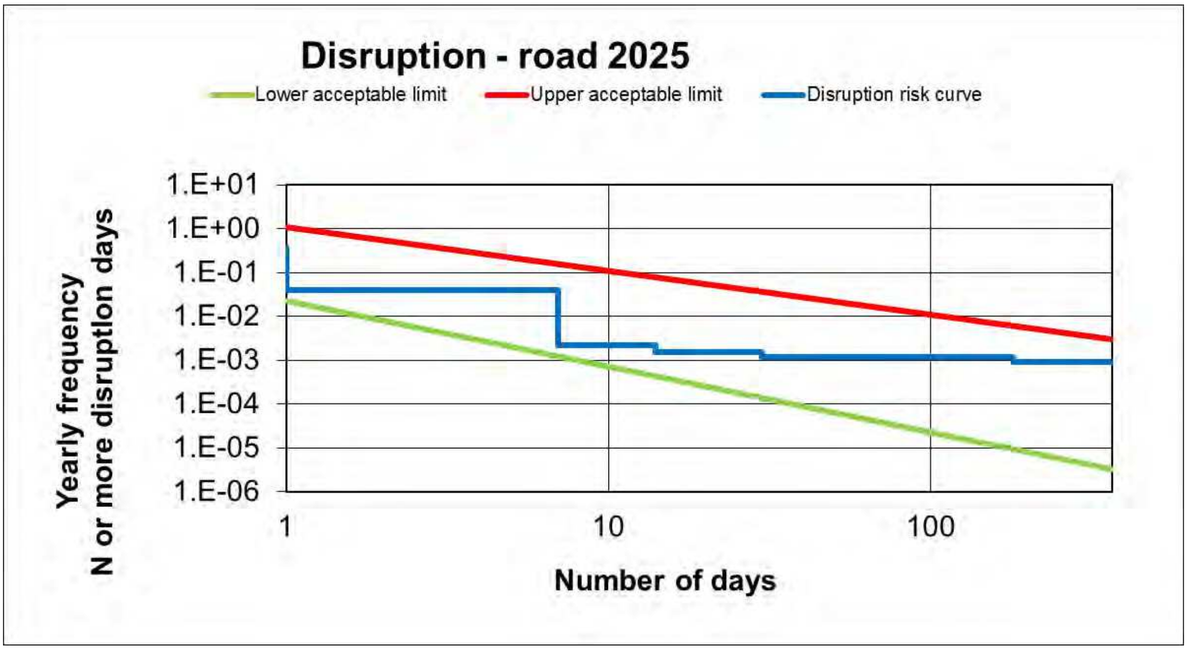

Figure 6-1 FN-curve for the disruption of the road part (one tube only) (2025)

It is seen that there is no violation of the upper-limit, and hence the calculated risk of disruption of the road part is considered acceptable.

It is highlighted that for most of the time where the road is disrupted, only one of the two road tubes are disrupted. The time where both road tubes are disrupted constitutes about 20% of the total disruption time.

6.4.2 Disruption rail

The total number of disruption days for rail in 2025 and the contributing factors are seen in Table 6-10. It is seen that the railway part is expected to be closed for about 0.495 days a year and that fire contribute with 52.7% and that external events (due to flooding of substations) contribute with 40.7%.

Disruption rail	Contribution	Percentage
Ordinary road	0	0%
Ordinary rail	$2.78 \cdot 10^{-3}$	0.56%
Fire, road	$5.04 \cdot 10^{-2}$	10.18%
Fire, rail	$1.01 \cdot 10^{-1}$	20.40%
Dangerous goods – road	$1.71 \cdot 10^{-3}$	0.35%
Dangerous goods – rail	$3.03 \cdot 10^{-4}$	0.06%
External events	$3.39 \cdot 10^{-1}$	68.45%
Total	$\mathbf{4.95 \cdot 10^{-1}}$	**100%**

Table 6-10 Total number of disruption days for the rail and the contributing factors (2025)

An FN-curve for the disruption of the rail part in 2025 is shown in Figure 6-2.

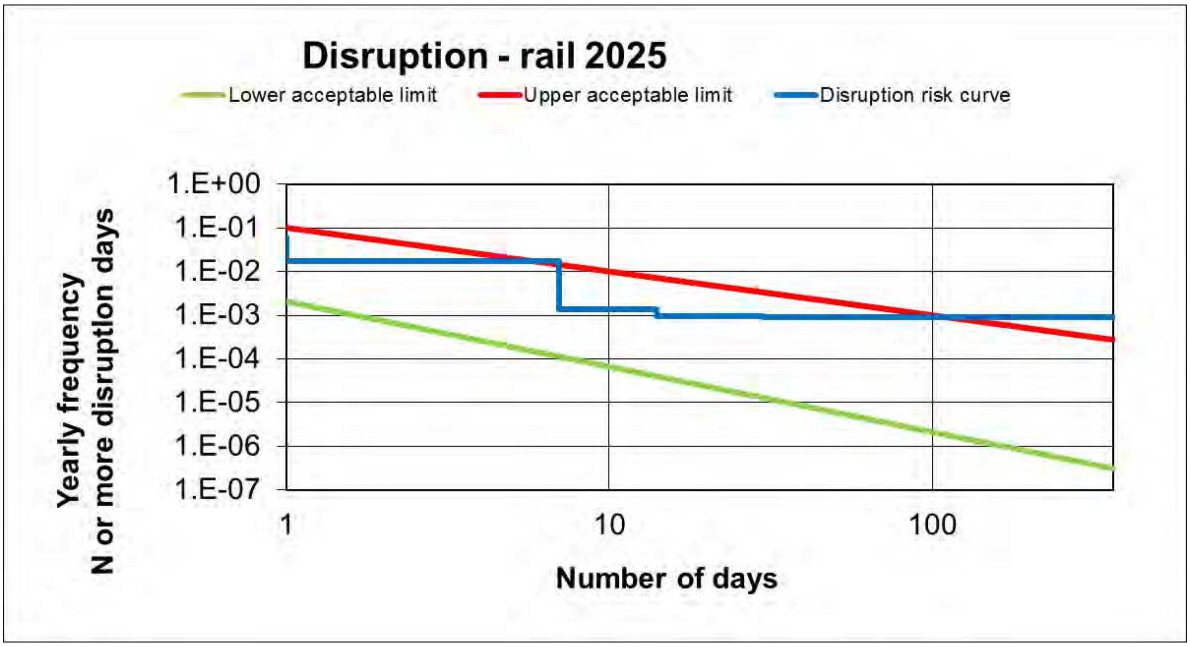

Figure 6-2: FN-curve for the disruption of the rail part (only one rail tube)

It is seen that there is violations of the upper-limit. This clearly follows that the mean value (for disrupting the railway) is larger than the acceptance criterion.

6.4.3 Simultaneous disruption of road and rail

Sections 6.4.1 and 6.4.2 presented the disruption of the road and rail respectively. Some of these disruptions will happen simultaneously, such that both the road and rail part are closed at the same time.

Disruption	2025	2045	Acceptance Criteria
Disruption, road alone [days per year]	0.60	0.96	6.5
Disruption, rail alone [days per year]	0.10	0.11	0.6
Disruption, simultaneous [days per year]	0.39	0.44	

Table 6-11 Simultaneous disruption times

In Table 6-9 and Table 6-10 it is seen that the individual road and rail parts are disrupted about 0.996 and 0.495 days respectively days in 2025, and about 0.40 of a day simultaneously, in 2025.

An FN-curve for the simultaneous disruption is shown in Figure 6-3.

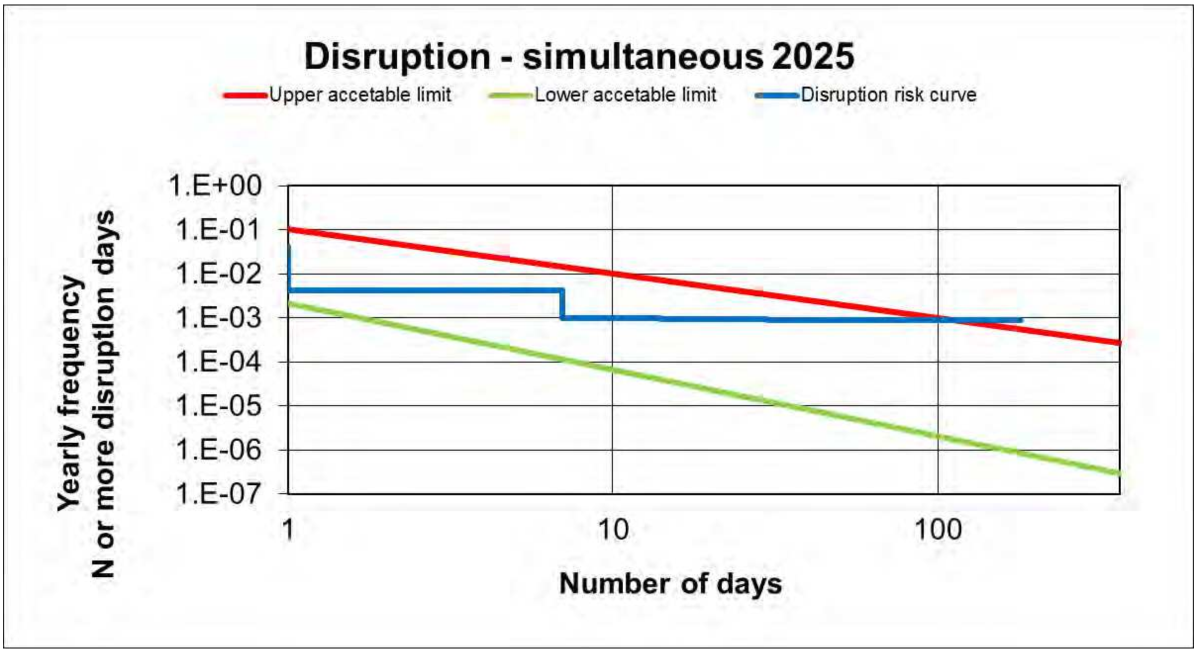

Figure 6-3: FN-curve for the simultaneous disruption of road and rail

It is seen that there is violations of the upper-limit. This clearly follows that the mean value (for disrupting the railway) is larger than the acceptance criterion.

6.5 Total risk cost

In this section the total cost of all risk contributions are summarized.

Million Euros	2025	2045	2025	2045
Fatalities	0.521	0.575	16.0%	9.0%
Societal loss				
Disruption, road alone	0.991	2.963	30.4%	46.1%
Disruption, rail alone	0.061	0.128	1.9%	2.0%
Disruption, simultaneous	0.922	1.891	28.3%	29.4%
Owner loss				
Disruption, road alone	0.338	0.096	10.4%	1.5%
Disruption, rail alone	0.013	0.022	0.4%	0.3%
Disruption, simultaneous	0.260	0.462	8.0%	7.2%
Repair cost	0.152	0.286	4.7%	4.5%
Total	**3.258**	**6.422**	**100.0%**	**100.0%**

Table 6-12 Total risk cost in million Euros

From Table 6-12 it is seen that the total risk cost is about €3.26 million Euros in 2025 and €6.42 millions in 2045.

In Table 6-13 the societal cost and owners' loss are amalgamated, and are graphically represented in Figure 6-4.

Euro	2025	2045	2025	2045
Fatalities	0.521	0.575	16.0%	9.0%
Disruption, road alone	1.329	3.058	40.8%	47.6%
Disruption, rail alone	0.074	0.150	2.3%	2.3%
Disruption, simultaneous	1.182	2.352	36.3%	36.6%
Repair cost	0.152	0.286	4.7%	4.5%
Total	**3.258**	**6.422**	**100.0%**	**100.0%**

Table 6-13 Total costs in million Euros

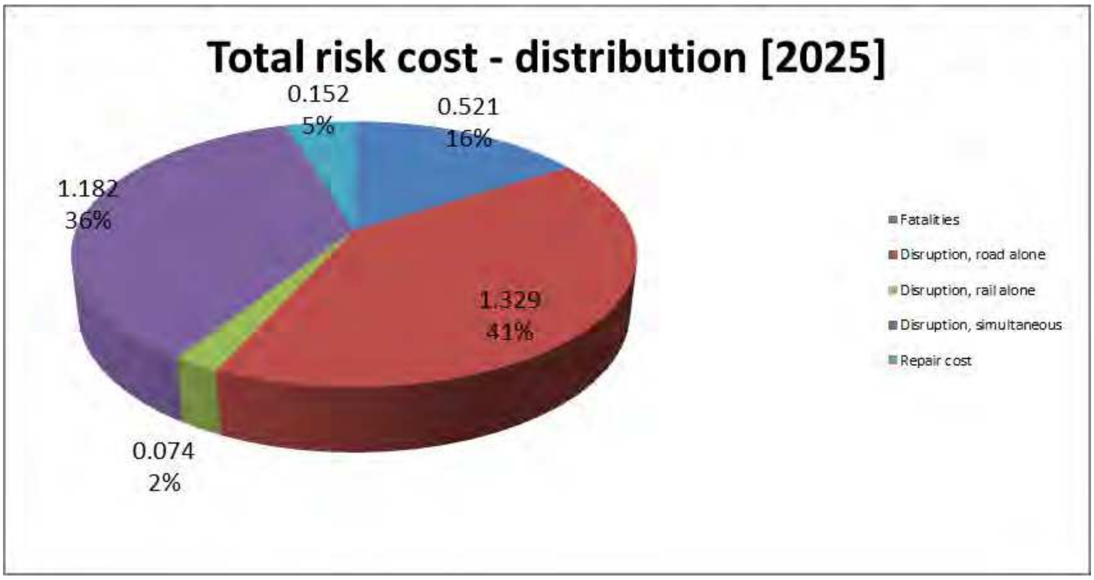

Figure 6-4 Total risk cost distribution

From Figure 6-4 it is seen that most of the risk costs – about 80% - originate from disruption, while repair costs and cost of fatalities costs are about 5% and 16% respectively.

Again it is underlined that the cost for disruption for road has been based on disruption of a single road tube only. This is very conservative because a single road tube is still available in most of the cases.

6.6 Impact of the dangerous goods restrictions on railway

The results presented in the previous sections do not take the restrictions in relation to dangerous goods into account (see section 4.4.4.).

In order to clarify the impact of the DG restrictions the results with and without DG restrictions are presented in Table 6-14.

Fatalities on road	Contribution	Contribution	Difference	Reduction
Ordinary road	$1.63 \cdot 10^{-1}$	$1.63 \cdot 10^{-1}$	0	
Fire	$9.58 \cdot 10^{-5}$	$9.58 \cdot 10^{-5}$	0	
Dangerous goods - road	$2.25 \cdot 10^{-3}$	$2.25 \cdot 10^{-3}$	0	
Dangerous goods - rail	$7.42 \cdot 10^{-6}$	$5.13 \cdot 10^{-6}$	$2.29 \cdot 10^{-6}$	30.9%
External events	$4.15 \cdot 10^{-5}$	$4.15 \cdot 10^{-5}$	0	
Total	$\mathbf{1.65 \cdot 10^{-1}}$	$\mathbf{1.65 \cdot 10^{-1}}$	$2.29 \cdot 10^{-6}$	**0.001%**

Fatalities on rail passengers	Contribution	Contribution	Difference	Reduction
Ordinary rail	$1.74 \cdot 10^{-3}$	$1.45 \cdot 10^{-3}$	$2.93 \cdot 10^{-4}$	16.8%
Collisions	$1.25 \cdot 10^{-3}$	$9.57 \cdot 10^{-4}$	$2.93 \cdot 10^{-4}$	23.4%
Derailment	$1.28 \cdot 10^{-4}$	$1.28 \cdot 10^{-4}$	0	
Collision with object	$3.62 \cdot 10^{-4}$	$3.62 \cdot 10^{-4}$	0	
Fire	$3.69 \cdot 10^{-5}$	$3.69 \cdot 10^{-5}$	0	
Dangerous goods - rail	$7.05 \cdot 10^{-7}$	0	$7.05 \cdot 10^{-7}$	100.0%
Dangerous goods - road	$7.51 \cdot 10^{-5}$	$7.51 \cdot 10^{-5}$	0	
External events	$4.01 \cdot 10^{-6}$	$4.01 \cdot 10^{-6}$	0	
Total	$\mathbf{1.86 \cdot 10^{-3}}$	$\mathbf{1.56 \cdot 10^{-3}}$	$2.94 \cdot 10^{-4}$	15.8%

Fatalities on rail employees	Contribution	Contribution	Difference	Reduction
Ordinary rail	$6.24 \cdot 10^{-4}$	$5.53 \cdot 10^{-4}$	$7.10 \cdot 10^{-5}$	11.4%
Collisions	$2.76 \cdot 10^{-4}$	$2.05 \cdot 10^{-4}$	$7.10 \cdot 10^{-5}$	25.8%
Derailment	$1.60 \cdot 10^{-4}$	$1.60 \cdot 10^{-4}$	0	
Collision with object	$1.89 \cdot 10^{-4}$	$1.89 \cdot 10^{-4}$	0	
Fire	$7.76 \cdot 10^{-7}$	$7.76 \cdot 10^{-7}$	0	
Dangerous goods - rail	$8.09 \cdot 10^{-8}$	$3.83 \cdot 10^{-8}$	$4.25 \cdot 10^{-8}$	52.6%
Dangerous goods - road	$4.12 \cdot 10^{-6}$	$4.12 \cdot 10^{-6}$	0	
External events	$2.20 \cdot 10^{-7}$	$2.20 \cdot 10^{-7}$	0	
Total	$\mathbf{6.29 \cdot 10^{-4}}$	$\mathbf{5.58 \cdot 10^{-4}}$	$7.10 \cdot 10^{-5}$	11.3%

Table 6-14 Impact of dangerous goods restriction on road users, rail passengers and employees

The following can be concluded:

- Impact from DG on rail on the road passengers is reduced with about 31%, however the reduction corresponds to only $2.29 \cdot 10^{-6}$ fatality per year
- With the restriction no impact on railway passengers can be detected, which is a reduction of $7.05 \cdot 10^{-7}$. However, it is interesting that DG on road contribute with two orders of magnitude more.
- Due to the restrictions some collisions are avoided between DG trains and other trains. This reduces the FWSI-figure on railway passengers with $2.93 \cdot 10^{-4}$ and the FWSI-figure for railway employees with $7.10 \cdot 10^{-5}$.
- The absolute reduction directly related to the dangerous goods on rail for railway passengers is $7.05 \cdot 10^{-7}$, corresponding to 0.04% of the total risk for this safety target
- The absolute reduction directly related to the dangerous goods on rail for railway employees is $4.25 \cdot 10^{-8}$, corresponding to 0.007% of the total risk for this safety target

The relative low impact on the railway passengers and railway employees indicates that restriction to dangerous goods transportation in the railway tunnel do not have a significant impact on the safety.

7. REVISIONS

This issue (revision 6) of the Operational Risk Analysis (ORA) delivered in June 2014 is an update of the earlier ORA report delivered in August 2013 (revision 5).

The previous versions are:

- Revision 4, October 2012
- Revision 3, January 2011
- Revision 2, October 2010
- Revision 1, June 2010

The revisions are described in detail in the following sections.

7.1 Revision 6

This update of the ORA contains the following larger changes:

- The lengths for the enclosed tunnel and landsides for both road and rail are updated.
- The traffic forecast is updated.
- The dangerous goods forecast is updated.
- The risk and acceptance criteria for the railway part are described for each common safety target in accordance with CSM including dividing the individual risk for rail into passenger risk and risk for employees, and all topics from TSI are covered in the ORA.
- The risk model is updated with a model for how often a dangerous goods wagon on a freight train will be involved in an accident.
- Instead of having one number for fatalities on rail for the catastrophic scenarios a distribution is made including the probability of having different combinations of train in the same tube as the accident and different combinations of train in the other tube.
- The risk model is setup with the restrictions for dangerous goods on the railway. The restrictions can be turned on/off separately to see the effect of each of the restrictions.
- Collisions with objects are included in the risk model.
- Fire detection is no longer part of the risk model in the railway part.
- The mechanical effects of the accidents on rail are included in the dangerous goods accidents.

Individual risk
The above changes (and more minor changes) lead to changes in the individual risk on road and rail as shown in Table 7-2 and Table 7-2.

	2025			2045		
	Individual Risk	Acceptable Risk	Fraction of acceptable risk	Individual Risk	Acceptable Risk	Fraction of accep-table risk
Road fatalities	0.17	0.22	74.0%	0.13	0.17	75.1%
Rail - FWSI – passengers	$2.60 \cdot 10^{-3}$	0.0031	84.2%	$2.78 \cdot 10^{-3}$	0.00309	90.0%
Rail - FWSI – employees	$8.81 \cdot 10^{-4}$	0.0109	8.0%	$1.22 \cdot 10^{-3}$	0.01486	8.2%
Rail - FWSI – Others	$1.15 \cdot 10^{-5}$	0.0035	0.3%	$1.72 \cdot 10^{-5}$	0.00346	0.5%

Table 7-1 Individual risk in revision 6.

		2025		2045	
		Acceptance criteria	Result fatalities per billion person passages	Acceptance criteria	Result fatalities per billion person passages
Revision 5	Road	20.92	5.0	10.46	2.6
	Rail	7.54	3.5	8.35	3.5

Table 7-2 Risk to individual life safety revision 5

The numbers in Table 7-1 and Table 7-2 are not directly comparable due to several things. First of all it is decided to communicate the risk in FWSI per year (instead of per passage) and the risk is furthermore split into different safety targets (passengers, employees and others).

Total cost
The changes lead to changes in the total costs for road and rail as shown in Table 7-3.

		2025	2045
Revision 6	Fatalities	0.521	0.575
	Disruption, road alone	1.329	3.058
	Disruption, rail alone	0.074	0.150
	Disruption, simultaneous	1.182	2.352
	Repair cost	0.152	0.286
	Total	**3.258**	**6.422**
Revision 5	Fatalities	0.162	0.189
	Disruption, road alone	0.881	2.801
	Disruption, rail alone	0.319	0.684
	Disruption, simultaneous	1.191	2.358
	Repair cost	0.187	0.324
	Total	**2.740**	**6.356**

Table 7-3 Comparison of total costs in million Euros for revision 6 and 5

Disruption
Table 7-4 presents a comparison of the disruption risk for the years 2018/2025 and 2038/2045 for revision 5 and 4.

		2025		2045	
		Acceptance criteria	Disruption days per year	Acceptance criteria	Disruption days per year
Revision 6	Disruption, road alone [days per year]	6.50	0.60	6.50	0.96
	Disruption, rail alone [days per year]	0.6	0.10	0.6	0.11
	Disruption, simultaneous [days per year]		0.39		0.44
Revision 5	Disruption, road alone [days per year]	6.50	0.63	6.50	1.00
	Disruption, rail alone [days per year]	0.6	0.44	0.6	0.52
	Disruption, simultaneous [days per year]		0.40		0.44

Table 7-4 Comparison of the disruption risk measured in days for revision 6 and 5

7.2 Revision 5

This update of the ORA contains the following changes:

- The reference years are changed to 2025 and 2045 on request from Femern A/S to ensure better alignment with design reports.
- The risk acceptance criterion for rail is based on the common safety targets (CST) which contains national reference values (NRV). The NRV for passengers is added a contribution from freight train drivers to include these in the analysis.
- The suppression system is no longer a part of the railway design, and this is now reflected the calculations.
- In all tables with fatalities in the railway part, an extra column has been inserted with the corresponding FWSI results.
- New data material from the European Railway Accident Information Links is used as basis for the derailment and collision frequencies.
- The forecast for dangerous goods on railway is updated to contain a small amount of explosives.
- Changes due to the CSM-RA assessment Phase I of RINA S.P.A./SINTEF Added general sections for improving the readability in relation to the railway part.
- An appendix is added to the accident frequencies report ref. [28] containing description of safety related functions and probability of failure on demand.

The data for the traffic forecast used in ORA revision 5 and revision 4 is presented in Table 7-5.

	Revision 4		Revision 5	
Road Traffic	**2018**	**2038**	**2025**	**2045**
Annual average daily traffic (AADT) [veh/day]	9856	16113	11723	19288
Cars	8325	12865	9819	15221
Cars (prof. activities) 30%	2497	3859	2946	4566
Cars (private use) 70%	5828	9006	6873	10655
Lorries	1395	3057	1751	3851
Coaches	136	191	153	215
Average person per vehicle	2.39		2.4	
Cars (prof. activities)	1.2		1.2	
Cars (private use)	2.9		2.9	
Lorries	1		1.0	
Coaches	35		35.0	
Average load per lorry in tons	15.5		15.5	

	Revision 4		Revision 5	
Rail Traffic	**2018**	**2038**	**2025**	**2045**
Average number of freight trains per day	49.0	113	78	96
Average number of passenger trains per day	40.0	40	40	40
Passengers per passenger train	95		95	
Operators/workers per trains	3		3	
Average load per freight wagon (ton)	17.7		17.7	
Number of wagons per freight train	30		30	

Table 7-5 Traffic data for ORA revision 5 and revision 4

The change in traffic volume affects all results since the number of accidents per year is calculated based on number of vehicle or rolling stock kilometres in the tunnel per year.

Individual risk

The above changes lead to changes in the individual risk on road and rail as shown in Table 7-6.

		2018/2025		2038/2045	
		Acceptance criteria	Result fatalities per billion person passages	Acceptance criteria	Result fatalities per billion person passages
Revision 5 (2025 and 2045)	**Road**	20.92	5.0	10.46	2.6
	Rail	7.54	3.5	8.35	3.5
Revision 4 (2018 and 2038)	**Road**	26.67	18.8	13.34	5.0
	Rail	1.95	2.4	1.95	2.8

Table 7-6 Comparison of risk to individual life safety between results in revision 5 and 4

Total cost

The changes lead to changes in the total costs for road and rail as shown in Table 7-7.

		2018/2025	2038/2045
Revision 5 (2025 and 2045)	Fatalities	0.162	0.189
	Disruption, road alone	0.881	2.801
	Disruption, rail alone	0.319	0.684
	Disruption, simultaneous	1.191	2.358
	Repair cost	0.187	0.324
	Total	**2.740**	**6.356**
Revision 4 (2018 and 2038)	Fatalities	0.564	0.332
	Disruption, road alone	1.196	2.648
	Disruption, rail alone	0.223	0.795
	Disruption, simultaneous	1.163	2.267
	Repair cost	0.143	0.292
	Total	**3.290**	**6.333**

Table 7-7 Comparison of total costs in million Euros for revision 5 and 4

Disruption

Table 7-8 presents a comparison of the disruption risk for the years 2018/2025 and 2038/2045 for revision 5 and 4.

		2018/2025		2038/2045	
		Acceptance criteria	Disruption days per year	Acceptance criteria	Disruption days per year
Revision 5 (2025 and 2045)	Disruption, road alone [days per year]	6.50	0.63	6.50	1.00
	Disruption, rail alone [days per year]	0.6	0.44	0.6	0.52
	Disruption, simultaneous [days per year]		0.40		0.44
Revision 4 (2018 and 2038)	Disruption, road alone [days per year]	6.50	0.54	6.50	0.70
	Disruption, rail alone [days per year]	0.6	0.31	0.6	0.6
	Disruption, simultaneous [days per year]		0.39		0.42

Table 7-8 Comparison of the disruption risk measured in days for revision 5 and 4

7.3 Revision 4

This update of the ORA is based on a request from Femern A/S to ensure that the Operational Risk Analysis incorporates the changes made in the design since revision 3 of the ORA was made in February 2011. These changes include changes in the length of the tunnel. The changes have affected basically all the results; on road in relation to individual risk (and subsequently societal risk), on individual risk on railway and also the risk of disruption.

The railway update concerns a new acceptance criteria based on National Reference Values see ref. [22], and update of a range of datasets. The latter include newer accidents data for ordinary rail accidents, time schedules for the train traffic and actual distribution of passengers on passenger trains. Furthermore, statistics on fires for different types of trains have been carried out. Finally, the traffic work of trains has been updated.

In the two previous revisions of the ORA, there was a high focus on aligning the risk analyses for the bridge and the tunnel solutions, and as a result of this, the landsides where excluded from the scope. The cross-overs on the landsides are taken into account in the present revision.

New acceptance criteria for disruption on the railway have been adopted from RAM work, ref. [24].

The location of substations and control-center have changed from on top of the tunnel portal to besides the tunnel, this has implied that the risk of flooding of substations and control-center has increased. This is analysed in the present revision.

A new hazard has been taken into account, namely damage to persons due to train in motion.

Furthermore, updates have been carried out regarding sunken ships on runnel roof, grounding ships on tunnel roof and dropped and dragged anchor.

The change in frequency and consequences for road accidents leads to changes in the individual risk on road as shown in Table 7-9.

		2018		2038	
		Acceptance criteria	Result fatalities per billion person passages	Acceptance criteria	Result fatalities per billion person passages
Revision 4	**Road**	26.67	18.8	13.34	5.0
	Rail	1.95	2.4	1.95	2.8
Revision 3	**Road**	18.14	13.30	9.07	7.01
	Rail	3.06	2.26	3.06	2.84

Table 7-9 Comparison of risk to individual life safety between results in revision 4 and 3

The change in frequency for road accidents leads to changes in the total costs for road as shown in Table 7-10.

		2018	2038
Revision 4	Fatalities	0.564	0.332
	Disruption, road alone	1.196	2.648
	Disruption, rail alone	0.223	0.795
	Disruption, simultaneous	1.163	2.267
	Repair cost	0.143	0.292
	Total	**3.290**	**6.333**
Revision 3	Fatalities	0.324	0.374
	Disruption, road alone	0.74	1.847
	Disruption, rail alone	0.067	0.24
	Disruption, simultaneous	0.198	0.606
	Repair cost	0.082	0.161
	Total	**1.411**	**3.228**

Table 7-10 Comparison of total costs in million Euros for revision 4 and 3

Table 7-11 presents a comparison of the disruption risk for the years 2018 and 2038 for revision 4 and 3.

		2018		2038	
		Acceptance criteria	Disruption days per year	Acceptance criteria	Disruption days per year
Revision 4	Disruption, road alone [days per year]	6.50	0.54	6.50	0.70
	Disruption, rail alone [days per year]	0.6	0.31	0.6	0.6
	Disruption, simultaneous [days per year]		0.39		0.42
Revision 3	Disruption, road alone [days per year]	6.5	0.33	6.5	0.54
	Disruption, rail alone [days per year]	6.5	0.09	6.5	0.18
	Disruption, simultaneous [days per year]	1.3	0.06	1.3	0.11

Table 7-11 Comparison of the disruption risk measured in days for revision 4 and 3

7.4 Revision 3

This update of the ORA is based on a request from Femern A/S to ensure as much as possible a consistent approach between the bridge and tunnel solutions. The changes have affected the results on road in relation to individual risk (and subsequently societal risk) and also the risk of disruption.

The update concerns the calculations based on statistical data from the Danish Road Directorate (VIS-database). The VIS-database has been used to calculate the percentage of the accidents on Danish motorways is relevant for the Fehmarnbelt Fixed Link. The same method has previously been used in revision 2, however in revision 3 a more conservative approach has been used, and the accidents in the database has been studied more in detail.

The change in frequency and consequences for road accidents leads to changes in the individual risk on road as shown in Table 7-12.

		2018		2038	
		Acceptance criteria	Result fatalities per billion person passages	Acceptance criteria	Result fatalities per billion person passages
Revision 3	**Road**	18.14	13.30	9.07	7.01
	Rail	3.06	2.26	3.06	2.84
Revision 2	**Road**	18.14	10.7	9.07	5.6
	Rail	3.06	2.26	3.06	2.84

Table 7-12 Comparison of risk to individual life safety between results in revision 3 and 2

The change in frequency for road accidents leads to changes in the total costs for road as shown in Table 7-13.

		2018	2038
Revision 3	Fatalities	0.402	0.463
	Disruption, road alone	0.731	1.832
	Disruption, rail alone	0.067	0.240
	Disruption, simultaneous	0.198	0.605
	Repair cost	0.082	0.161
	Total	**1.479**	**3.301**
Revision 2	Fatalities	0.324	0.374
	Disruption, road alone	0.74	1.847
	Disruption, rail alone	0.067	0.24
	Disruption, simultaneous	0.198	0.606
	Repair cost	0.082	0.161
	Total	**1.411**	**3.228**

Table 7-13 Comparison of total costs in million Euros for Revision 3 and 2

Table 7-14 presents a comparison of the disruption risk for the years 2018 and 2038 for revision 3 and 2.

		2018		2038	
		Acceptance criteria	Disruption days per year	Acceptance criteria	Disruption days per year
Revision 3	Disruption, road alone [days per year]	6.5	0.33	6.5	0.54
	Disruption, rail alone [days per year]	6.5	0.09	6.5	0.18
	Disruption, simultaneous [days per year]	1.3	0.06	1.3	0.11
Revision 2	Disruption, road alone [days per year]	6.5	0.34	6.5	0.55
	Disruption, rail alone [days per year]	6.5	0.09	6.5	0.18
	Disruption, simultaneous [days per year]	1.3	0.06	1.3	0.11

Table 7-14 Comparison of the disruption risk measured in days for Revision 3 and 2

7.5 Revision 2

This update of the ORA is based on a request from Femern A/S to ensure as much as possible a consistent approach between the bridge and tunnel solutions. The changes have affected the results both for road and rail in relation to individual risk (and subsequently societal risk) and also the risk of disruption. The update consists of two parts:

- Update of the fatalities per accident for road accidents
- Update of the tunnel length

The fatality per accident has been updated based on a benchmark suggested by Femern A/S, which have affected the results for fatalities on road, see Table 7-15. In revision 1 the number of fatalities per kilometre in 2018 and 2038 was calculated, based on a decreasing statistical trend. In revision 1 the half-life period was estimated to be 9.5 years. Femern A/S has requested that a more conservative approach is used and that the half-life period should be 20 years. Because of the more conservative approach the acceptance criteria between rev 1 and 2 have been increased, as shown in Table 7-15.

The tunnel length has changed between revisions 1 and 2 of the ORA from 25.4 km to 18.14 km. The scope is now identical in both the bridge and tunnel risk analyses enabling a more direct comparison to be made. The new scope includes the tunnel structure only. However, it should be noted that the risk figures should now only be used comparatively as they no longer represent the absolute risk. The absolute risk would incorporate the entire tunnel structure in addition to the landside road and railway to the hinterland connections. The change in length leads to changes in the acceptance criteria for individual risk on road and rail as shown in Table 7-15.

		2018		2038	
		Acceptance criteria	Result fatalities per billion person passages	Acceptance criteria	Result fatalities per billion person passages
Revision 2	**Road**	18.14	10.7	9.07	5.6
	Rail	3.82	2.26	3.89	2.84
Revision 1	**Road**	9.70	7.90	2.30	1.90
	Rail	4.40	3.70	4.40	4.00

Table 7-15 Comparison of risk to individual life safety between results in revision 2 and 1

Table 7-16 present a comparison of the results for the total costs for years 2018 and 2038 for both revisions 1 and revision 2.

		2018	2038
Revision 2	Fatalities	0.324	0.374
	Disruption, road alone	0.740	1.847
	Disruption, rail alone	0.067	0.240
	Disruption, simultaneous	0.198	0.606
	Repair cost	0.082	0.161
	Total	**1.411**	**3.227**
Revision 1	Fatalities	0.248	0.146
	Disruption, road alone	1.051	5.373
	Disruption, rail alone	1.459	5.202
	Disruption, simultaneous	0.199	0.601
	Repair cost	0.396	0.828
	Total	**3.354**	**12.151**

Table 7-16 Comparison of total costs in million Euros between results in Revision 2 and 1

Table 7-17 present a comparison of the disruption risk for years 2018 and 2038 for both revision 1 and revision 2.

		2018		2038	
		Acceptance criteria	Disruption days per year	Acceptance criteria	Disruption days per year
Revision 2	Disruption, road alone [days per year]	6.5	0.34	6.5	0.55
	Disruption, rail alone [days per year]	6.5	0.09	6.5	0.18
	Disruption, simultaneous [days per year]	1.3	0.06	1.3	0.11
Revision 1	Disruption, road alone [days per year]	6.5	0.48	6.5	0.67
	Disruption, rail alone [days per year]	6.5	2.00	6.5	3.96
	Disruption, simultaneous [days per year]	1.3	0.06	1.3	0.11

Table 7-17 Comparison of disruption risk between results in Revision 1 and 2

The numbers from revision 1 is used if not updated in revision 2.

7.6 Revision 1

The first update of the ORA was necessary as a result of changes in design parameters and to ensure as much as possible a consistent approach between the bridge and tunnel solutions.

The following inputs to the calculations have been changed between revisions 0 and 1 of this report:

- Road accident frequency
- Road accident fatalities
- Road fire frequency
- Road fire fatalities
- Tunnel length
- Traffic data

The changes have affected the results both for road and rail in relation to individual risk (and subsequently societal risk) and also the risk of disruption. Table 7-18 present a comparison of the results for years 2018 and 2038 for both revision 0 and revision 1.

		2018		2038	
		Acceptance criteria	Fatalities per billion passages	Acceptance criteria	Fatalities per billion passages
Revision 1	**Road**	9.7	7.9	2.3	1.9
	Rail	4.4	3.7	4.4	4.0
Revision 0	**Road**	26.5	19.9	26.5	20.7
	Rail	3.8	2.76	3.8	3.2

Table 7-18 Comparison of risk to individual life safety between results in Revision 1 and 0

Note that in regard to individual risk to life safety, in the year 2038 it is shown to be safer to travel by car than by train. Typically this is not the case however the reason is that in revision 1 new statistical data from the Danish Road Directorate is used for accident frequency and number of fatalities on the road (see section 7.6.1 and section 7.6.2). The frequency of accidents and fatalities is considered to decrease over time while the accident frequency on rail is assumed to be constant. It is likely that train safety will also improve over time, however, no statistical trends have been found in the available data for rail and cannot therefore be included in this report.

Table 7-19 presents a comparison of the results for the total costs for years 2018 and 2038 for both revision 0 and revision 1.

		2018	2038
Revision 1	Fatalities	0.248	0.146
	Disruption, road alone	1.051	5.373
	Disruption, rail alone	1.459	5.202
	Disruption, simultaneous	0.199	0.601
	Repair cost	0.396	0.828
	Total	**3.354**	**12.15**
Revision 0	Fatalities	0.588	1.168
	Disruption, road alone	3.011	9.478
	Disruption, rail alone	1.226	3.810
	Disruption, simultaneous	0.562	1.651
	Repair cost	0.648	1.177
	Total	**6.035**	**17.284**

Table 7-19 Comparison of total costs in million Euros between results in Revision 1 and 0

Table 7-20 present a comparison of the disruption risk for years 2018 and 2038 for both revision 0 and revision 1.

		2018		2038	
		Acceptance criteria	Disruption days	Acceptance criteria	Disruption days
Revision 1	Disruption, road alone [days]	6.5	0.48	6.5	0.67
	Disruption, rail alone [days]	6.5	2.00	6.5	3.96
	Disruption, simultaneous [days]	1.3	0.06	1.3	0.11
Revision 0	Disruption, road alone [days]	6.5	1.38	6.5	2.30
	Disruption, rail alone [days]	6.5	1.681	6.5	2.899
	Disruption, simultaneous [days]	1.3	0.183	1.3	0.300

Table 7-20 Comparison of disruption risk between results in Revision 1 and 0

7.6.1 Road accident frequency

In the revision 0 of the Conceptual Design Operational Risk Analysis (ORA) the traffic accident frequency and the traffic accident fatalities were assessed based on statistical data from 2001 to 2007. It was assumed that there would be the same frequency of traffic accidents per driven km in 2018 and 2038 as there was on average between 2001 and 2007. It was also assumed that the number of fatalities per accident would be the same in 2018 and 2038 as on average between 2001 and 2007.

These assumptions are however considered to be conservative given that there are strong indicators in the statistics that point to a decrease both in accident frequencies and in fatalities on road. In revision 1 of the ORA the development of traffic accident frequencies and consequences for the year 2018 and 2038 are estimated based on statistical trends.

The statistics indicate, contrary to the assumption of the accident frequency and fatalities per accident remaining constant, that there will be a decrease in accident frequencies and consequences between 2018 and 2038. In Table 7-21 the values from ORA revision 0 are presented together with extrapolated values for motorways based on the statistical data from the Danish Road Directorate as used in revision 1.

Total number of accidents per year	2018	2038
Revision 1	3.116	2.199
Revision 0	4.270	6.140

Table 7-21 Accident frequency per year for ORA revision 1 and 0 for the Fehmarnbelt Fixed link

This change in input affects a number of the results including individual risk to life safety, disruption and societal risk.

7.6.2 Road accident fatalities

In a similar manner to which the accident frequency is extrapolated the average number of fatalities per year is also expected to decrease again based on the statistical data from the Danish Road Directorate. Table 7-22 presents the average number of fatalities used in revision 0 and the revised number of fatalities per accident, based on statistical trends, which have been used in revision 1.

Average number of fatalities per accident	2018	2038
Revision 1	0.025	0.013
Revision 0	0.0451	

Table 7-22 Fatalities per accident in revision 1 and 0

This change in input affects individual risk to life safety for road users.

7.6.3 Road fire frequency

The fire frequencies used for the road in the ORA have been updated in light of more recent statistics. The fire frequencies used in revision 0 were based on data from PIARC. PIARC data for the frequency of fires in road tunnels is based on statistics from years 1968 to 1992 and is therefore considered to be conservative. In revision 1, Danish statistics for road fires have been used and are considered to be more appropriate in this situation. Firstly, as a result of representing the vehicles typically expected to use the tunnel and secondly since they are considered to be more up to date.

	Revision 1	Revision 0
Car fire frequency	$6.75 \cdot 10^{-9}$	$1.50 \cdot 10^{-8}$
HGV fire frequency	$1.39 \cdot 10^{-8}$	$3.08 \cdot 10^{-8}$
Bus fire frequency	$1.39 \cdot 10^{-8}$	$3.08 \cdot 10^{-8}$
DGV fire frequency	$1.03 \cdot 10^{-8}$	$2.30 \cdot 10^{-8}$

Table 7-23 Fire frequency per year and vehicle km for ORA revision 1 and 0 for the Fehmarnbelt Fixed link

This change in input affects the individual risk to life safety in addition to the disruption for both the road and rail tunnels.

7.6.4 Road fire fatalities

In line with revised modelling of the fire scenarios in the road tunnel the fatalities expected given specific scenarios have been made more conservative. The number of fire scenarios in which fatalities are expected has increased from four to nine. These scenarios are all considered high challenge fires and extreme events in that they have very long return period. Thus, although the increase to life safety increases, the overall number of fatalities per year does not increase significantly due to the low likelihood of these scenarios occurring.

7.6.5 Tunnel length

The tunnel length has been changed during the conceptual design phase. The lengths of road and rail ramps on the landside areas have also changed.

In revision 0 of the ORA the road link was taken as 18,690m while the rail link was taken as 19,529m

In revision 1 of the ORA the road link is 25,430m and the rail link is 26,055m.

As the accident frequency is per km this increased length leads to increased accidents on both road and rail and therefore impacts on all aspects of the ORA.

7.6.6 Traffic data

The traffic data has been changed on request from Femern A/S. The data used in ORA revision 0 and revision 1 is presented in Table 7-24.

	Revision 0		Revision 1	
Road Traffic	**2018**	**2038**	**2018**	**2038**
Annual average daily traffic (AADT) [veh/day]	9,639	13,856	9,856	16,113
Cars	8,152	11,190	8,325	1,2865
Cars (prof. activities) 30%	2,446	3,357	2,497	3,859
Cars (private use) 70%	5,707	7,833	5,828	9,006
Lorries	1,352	2,492	1,395	3,057
Coaches	134	173	136	191
Average person per vehicle	2.4		2.4	
Cars (prof. activities)	1.2		1.2	
Cars (private use)	2.9		2.9	
Lorries	1.0		1.0	
Coaches	35		35.0	
Average load per lorry in tons	15.9		15.9	
	Revision 0		**Revision 1**	
Rail Traffic	**2018**	**2038**	**2018**	**2038**
Average number of freight trains per day	47	93	49.0	113
Average number of passenger trains per day	40	42	40.0	40
Passengers per passenger train	95		95	
Average number of operators/workers on trains	3		3	
Average load per freight wagon	17.0		17.7	
Number of wagons per freight train	30		30	

Table 7-24 Traffic data for ORA revision 0 and revision 1

The change in traffic volume affects all results since the number of accidents per year is calculated based on number of vehicle or rolling stock kilometres in the tunnel per year.

8. FUTURE WORK

In the next revision ORA 2014 (Autumn) updates will at least be made on the following topics:

- Dragged and dropped anchor; at the time detailed studies are made for dragged and dropped anchor. These studies will be included in the ORA.
- Grounding ships; at the time detailed studies are made for grounding ships. These studies will be included in the ORA.
- A more detailed study of the disruption of the road and rail, focus on updates in design regarding location of control centre and substation.
- The evacuation model on road and rail relative to the fire consequence calculations will be looked over and updated if it is found necessarily.
- A more detailed study at the consequences at the landsides (especially at Lolland as the safety zone is shorter than the Femern side). This study will include a more thorough description of the landsides with focus on safety.
- The costs of fatalities etc. will be updated to 2014 prices (instead of the present 2009 prices)
- Include new data from DHI for wave heights and sea level.
- Include results from the risk study of laybys.
- Update of the Operational Risk Management Plan
- Possible cost benefit analysis of FFFS (fixed fire fighting system)

9. APPENDIX A – RELEASE OF DANGEROUS GOODS – GENERAL ASSUMPTIONS

In order to access the consequences in accidents where dangerous goods are involved, some assumptions have been made, e.g., regarding size of releases, and toxicity limits for the selected substances.

The assumptions are all related to the chosen scenarios involving dangerous goods, which are the following:

- Ammonia release
- Chlorine release
- Flammable liquids
- LPG
- Explosives
- Acids and bases (corrosives)

9.1 Assumptions

General assumptions made:

- The upper limit for the longitudinal tunnel ventilation is an air velocity of 10 m/s.
- The critical velocity in terms of smoke ventilation is set to 3.2 m/s for a 200 MW fire scenario, ref. [16].
- The CFD-model includes: 2 groups of jet fans with each 4 parallel jet fans
    - Internal diameter 1250 mm
    - Jet velocity: 35 m/s (max)
    - Thrust pressure: 1600 N
    - Length of jet fan: 6 meter
    - Start up time: 60 sec.

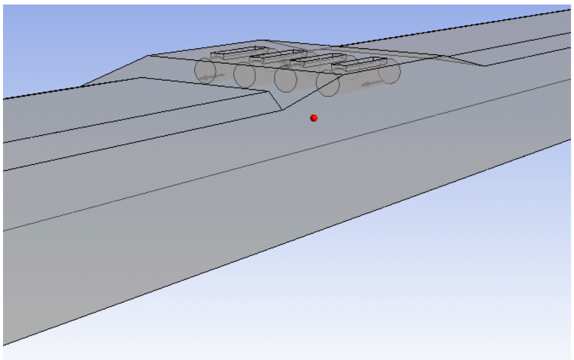

Figure 9-1: Location of jet fans used in the CFD-modelling of releases in road part

9.1.1 Release sizes

In the consequence modelling different sizes of release have been modelled; namely small, medium and large. In this section is described how "small", "medium" and "large" have been interpreted. The flow rates are calculated using QRA Pro, ref. [17].

The flow rates for ammonia/chlorine are presented in Table 9-1, and for LPG in Table 9-2.

Release size	Storage pressure	Hole size (diameter)	Calculated mass flow rate
Small	80 bar	0.1″	0.308 kg/s
	100 bar	0.1″	0.345 kg/s
Medium	80 bar	1″	30.8 kg/s
	100 bar	1″	34.5 kg/s
Large	80 bar	10″	3080 kg/s
	100 bar	10″	3450 kg/s

Table 9-1 Representative release sizes of ammonia and chlorine and calculated mass flow rates

Release size	Storage pressure	Hole size (diameter)	Calculated mass flow rate
Small	80 bar	0.1″	0.288 kg/s
	100 bar	0.1″	0.322 kg/s
Medium	80 bar	1″	28.8 kg/s
	100 bar	1″	32.2 kg/s
Large	80 bar	10″	2880 kg/s
	100 bar	10″	3220 kg/s

Table 9-2 Representative release sizes of LPG and calculated mass flow rates

From Table 9-1 and Table 9-2 it is seen that the difference in mass flow rates between ammonia, chlorine and LPG do not differ significantly, hence for all three substances the values presented in Table 9-3 have been used in modelling.

Release size	Storage pressure	Hole size (diameter)	Calculated mass flow rate
Small	80 bar	0.1″	0.288 kg/s
Medium	80 bar	1″	28.8 kg/s
Large	80 bar	10″	2880 kg/s

Table 9-3 Mass flow rates of ammonia, chlorine and LPG used in the CFD-modelling

9.1.2 Location of source of release

Some assumptions regarding the source to the release, namely:

- Release source is the back-end of truck and cover the whole area of the back face of the truck, see Figure 9-2.
- Only diffusive leaks have been analysed
- Jet release is assumed to be converted into diffusive leak due to blockage

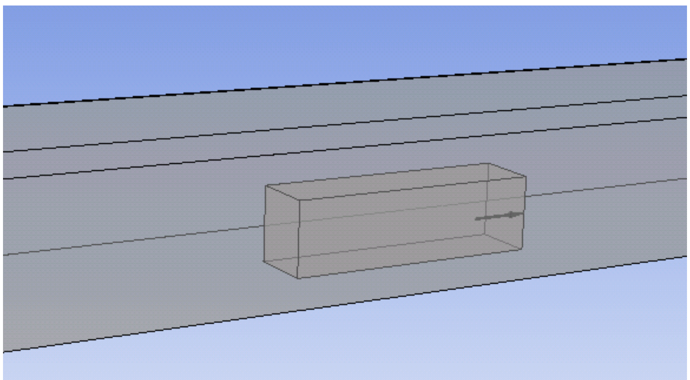

Figure 9-2: Location of the source to the release of dangerous goods

9.1.3 Assessment of impact from toxic release

A number of toxic materials will be transported on the Fehmarnbelt Fixed Link. Following an accident with a truck or a freight train transporting dangerous goods, there is a possibility for a release of toxic materials. In this assessment ammonia and chlorine have been selected as representative materials, why these two materials have been investigated. The release of toxic materials will have no influence on the structure, but could have serious consequences for the users. A typical accident in the road tube would be a truck accident where the truck will block the traffic and traffic will queue up behind the truck. The vehicles in front of the accident are in these circumstances assumed to drive out of the tunnel.

9.1.3.1 Individual risk

The consequence assessment for toxic releases used in this assessment is based on dispersion calculations in combination with computational-fluid-dynamics (CFD)-modelling and probit functions. The probit function predicts human impact in terms of the probability of fatalities given a certain concentration and a certain time of exposure.

9.1.3.2 Dispersion calculations and CFD modelling

CFD-modelling has been carried out for representative substances. This includes dispersion analyses of chlorine and ammonia. The consequences of selected release sizes (see section 9.1.1) are based on the results from dispersion calculations. The dispersion calculations are computed by means of the air-concentrations at given locations of the given substances in the tubes.

The results of the modelling are presented in ref. [3].

9.1.3.3 Probit and LC50

The individual risk in terms of a probability of fatalities is modelled with a probit function, reflecting the toxic dose, i.e. exposed concentration and time. The dispersion modelling is linked to the probit function by determining the size of a cloud giving a 50% probability of fatality at the exposure time given by the size of the cloud or the release duration, or both. The probits used are those recommended by DNV Technica, ref. [18]. A probit function is material/substance dependent and it is expressed as:

$$\mathrm{Pr} = a + b\ln(C^n t)$$

Where *Pr* is the probit value for death

C is the concentration of toxic material ppm

a, *b* and *n* are material constants

t is the time of exposure, minutes

The probit value is transferred to a probability of fatalities through a normal distribution. If the concentration varies during the time of exposure, the concentration should be expressed as an integral of time. In this assessment it is assumed that the concentration of exposure is approximately time independent. The human impact is described in terms of a 50% fatality, which is a common means to determine the number of people affected by a given incident within a uniform population, e.g. a car queue in the tunnel. The 50% limit is used as it is a measure of the average fatal dose. Weaker individuals being beyond the envelope may be among the casualties while stronger individuals within will survive, i.e. the 50% fatality criterion is used to predict a 100% fatality level.

The deadly concentrations can be calculated by means of the formula below:

$$\text{LC50 after t min. exposure} = \left(\frac{\exp\left(\frac{p-a}{b}\right)}{t} \right)^{\frac{1}{b}}$$

- t: time in minutes
- p = Pr(50%) =5

9.1.4 Corrosive release

A corrosive substance is one that will destroy or irreversibly damage another substance with which it comes into contact. The main hazards to people include damage to the eyes, the skin, and the tissue under the skin; inhalation or ingestion of a corrosive substance can damage the respiratory and gastrointestinal tracts. Exposure results in chemical burn. The most common strong acids are sulfuric acid, nitric acid and hydrochloric acid (H_2SO_4, HNO_3 and HCl, respectively).

9.1.4.1 Individual risk

The human impact of a corrosive release inside the tunnel will be dependent of the released material and the time for exposure although people may be seriously injured by the liquid itself or fumes due to reactions. The likelihood of fatalities is low. The percentage of fatalities due to an accident with corrosive release is therefore assumed to be the same as for ordinary rail accidents involving freight trains, described in section 4.1.2.1.

9.1.4.2 Disruption

Corrosive releases may be releases of typically acids or bases. Corrosive materials are normally transported in thin walled tanks on trucks or on railway. The capacity of the drainage system will affect the impact of a release. Two sub sumps in the road tubes will have sufficient volume to collect the contents of a tank truck (30 m^3). Two sub sumps in the rail tubes will have sufficient volume to collect the contents of one tank wagon (80 m^3). The sumps will be emptied with a tanker. Assuming that an available tanker is one hour away and it will take 15 minutes to empty the sumps and another 15 minutes to make the dissention to open the tunnel again.

9.1.5 Ammonia release

Ammonia is a colourless gas with a characteristic pungent smell. It is lighter than air, its density being 0.589 times that of air. It is easily liquefied due to the strong hydrogen bonding between molecules. Ammonia does not burn readily or sustain combustion, except under narrow fuel-to-air mixtures of 15-25% air. Anhydrous ammonia is classified as toxic and inhalation of concentrated gas can be lethal.

9.1.5.1.1 Individual risk

The consequence for individuals is assessed for release of ammonia based on CFD-modelling and probit functions. The result is presented in the following section.

9.1.5.2 CFD calculations

CFD-modelling has been carried out for two scenarios for ammonia:

- Small release
- Medium release

The release sizes used in the modelling are defined in Table 9-3. The small release gives a concentration below 4.200 ppm. The small release scenario does not lead to a critical situation, not even for the driver. Hence, no fatalities are expected in this scenario.

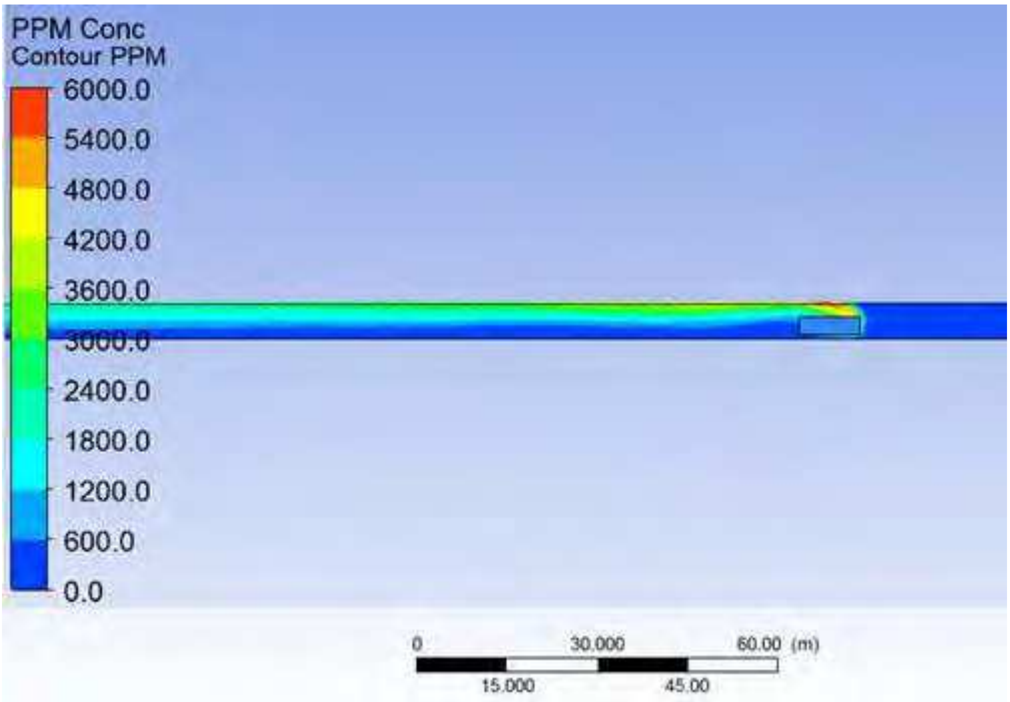

Figure 9-3 Result from CFD calculations for small release of ammonia

The medium release scenario leads to a concentration of 40.000 ppm which is a critical situation for the people in the tunnel. The number of fatalities depends on the number of people in the tunnel following a release.

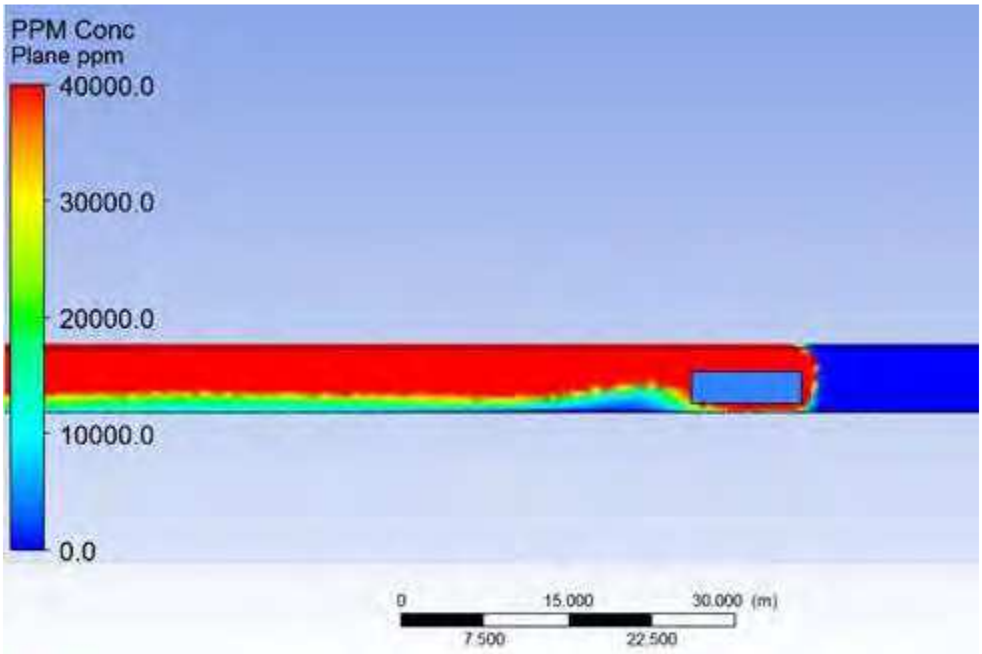

Figure 9-4 Result from CFD calculations for medium release of ammonia

Since the medium release gives a concentration high enough to create a critical situation, CFD –modelling has not been performed for large releases. Assumptions of the concentrations for a large release have been made based on the medium release.

9.1.5.3 **Probit and LC50**

The most severe consequences from an ammonia release will origin from ammonias toxicity; the deadly concentrations are given below:

- *a: -15.8*
- *b: 1*
- *n: 2.0*

An example is LC50 with an exposure time of 10 minutes given Pr(50%) = 5 and an ammonia gas intensity of 0.69 kg/m^3.

LC50 after 30 min. exposure: $$\left(\frac{\exp\left(\frac{5+15.8}{1}\right)}{30}\right)^{\frac{1}{2}} \approx 6000\ mg/m^3 \approx 8700\,ppm$$

In Table 9-4 LC50 for different exposure time is presented. Exposure times below 5 minutes contain large uncertainties.

Exposure time (minutes)	**LC50**	
	mg/m^3	**Ppm**
½	46471	64542
1	32860	45638
5	14695	20410
15	8484	11784
30	5999	8332
60	4242	5892

Table 9-4 LC50 for ammonia - Lethal concentration as a function of probability of fatality at different exposure times

In the risk assessment it is assumed that a concentration above 8695 ppm in more than 5 minutes will be lethal. And for exposure time less than 5 minutes a concentration above 21.295 ppm is assumed to be lethal.

Ammonia vapour has a sharp, irritating, pungent odour that acts as a warning of potentially dangerous exposure. The average odour threshold is 5 ppm, well below any danger or damage. Exposure to very high concentrations of gaseous ammonia can result in lung damage and death.

9.1.5.3.1 **Consequences to the structure and the installations**

The consequences to the structure and the tunnel installations due to a toxic release of ammonia may be similar to those of a corrosive release; e.g. released gases may react with water in the drainage system and with concrete moisture. The tunnel will need to be cleaned from the toxic release by washing the interior with water. The concrete, asphalt and different installations may need to be replaced, but the restoration of the tunnel must not necessary include closure of both of the road or railway tubes.

9.1.5.3.2 **Disruption**

The capacity of the drainage system will affect the impact of a release in the same way as for corrosive release see section 9.1.4.2.

9.1.6 Chlorine release

Chlorine is a toxic gas that irritates the respiratory system. Because it is heavier than air, it tends to accumulate at the bottom of poorly ventilated spaces. Chlorine gas is a strong oxidizer, which may react with flammable materials. Chlorine is detectable in concentrations of as low as 0.2 ppm. Coughing and vomiting may occur at 30 ppm and lung damage at 60 ppm. About 1000 ppm can be fatal after a few deep breaths of the gas.

9.1.6.1.1 Individual risk

The consequence for individuals is assessed for release of chlorine based on CFD-modelling and probit functions. The result is presented in the following section.

9.1.6.1.2 CFD calculations

The same CFD–modelling as for ammonia is used to determine the concentration of chlorine in the tunnel after an accident which leads to a release. A small release gives a concentration of 4200 ppm and a medium release gives a concentration of 40 000 ppm. It is assumed that a large release gives the same consequence as a medium release.

9.1.6.2 Probit and LC50

The most severe consequences from a chlorine release will origin from chlorines toxicity; the deadly concentrations are given below:

- *a: -14.8*
- b: 1
- *n: 2.3*

An example is LC50 with an exposure time of 10 minutes given Pr(50%) = 5 and a chlorine gas intensity of 0.10 kg/m^3.

LC50 after 30 min. exposure: $$\left(\frac{\exp\left(\frac{5+14.3}{1}\right)}{30}\right)^{\frac{1}{2}} \approx 1005 \ mg/m^3 \approx 335\,ppm$$

In Table 9-4 LC50 for different exposure time is presented. Exposure times below 5 minutes contain large insecurities.

Exposure time (minutes)	LC50	
	mg/m^3	ppm
½	5959	1986
1	4409	1470
5	2190	730
15	1358	453
30	1005	335
60	743	248

Table 9-5 LC50 for chlorine - Lethal concentration as a function of probability of fatality at different exposure times

9.1.6.3 Consequences to the structure and the installations

The consequences to the structure and the tunnel installations due to a toxic release of chlorine are assumed to be the same as for ammonia, see section 9.1.5.3.1 .

9.1.6.3.1 Disruption

The capacity of the drainage system will affect the impact of a release in the same way as for corrosive release see section 9.1.4.2.

9.1.7 Detection of release

There are installed a few (five) gas detectors in the tunnel in order to measure the NO_x-concentration. No detectors are installed with the specific purpose of identifying releases of dangerous goods.

The tunnel is designed with a VAID (Vehicle Accident and Incident Detection)-system that automatically detects if a vehicle is stopped in the tunnel. In the analysis it has been assumed that all significant releases of dangerous goods are related to traffic accidents, hence the vehicle releasing the dangerous goods will be stopped. The VAID system is designed such that it automatically starts up ventilation in order to avoid back-layering of smoke (in possible fire scenarios) and gasses (from dangerous goods releases).

It the analyses it has been assumed that it will take 1 minute to detect the release/accident (by means of a stopped vehicle) and start the ventilation up.

9.2 Assessment of impact from explosions

Explosions in terms of deflagration or detonation may be a result of ignition of solid explosives or releases of LPG or similar materials. The following section presents the estimate of fatalities in detonation of solid explosives, and the results of ignition of gas clouds leading to deflagration. The effects of a detonation of solid explosives are only presented as an estimate of the number of fatalities.

9.2.1 Solid explosives

Solid explosives are likely to be transported to some extent through the tunnel. If such goods should detonate the consequences will probably be severe. Explosives are normally transported in bulk packages and the amounts up to 1000 kg on road. In risk assessment for the Øresund link ref. [13] calculations regarding explosions were made.

The assessment for Øresund showed that the consequences of an accident involving explosion of solid explosives will be severe, and considering the overpressures possible in case of a detonation, a collapse of several tunnel elements is possible. A collapse of one tunnel element due to an explosion in one tube will affect vehicles in the accident tube as well as in the other tubes. An explosion might cause collapse of more than one element. Vehicles which just have passed the collapsing element are assumed to be able to drive out of the tunnel.

9.2.2 Vapour cloud explosion

A vapour cloud explosion is a deflagration creating an overpressure pulse as the flame front burns from the point of ignition. The velocity of the flame front, which determines the overpressure, is dependent on the size of the gas cloud in the tunnel. The length of the gas cloud from typical release scenarios (se section 9.1.1) are determined by dispersion calculations previously described.

The consequences of an explosion of a continuous release of LPG in terms of fatalities due to an explosion in the tunnel are estimated by assuming that people inside the exploding gas cloud will be fatally injured. People outside the cloud are assumed not to be harmed. The CFD modelling for the road tube showed that a medium release of LPG will give a gas cloud larger than 200 m within 150 seconds. It also indicates that a small release will not be sufficient to get an explosion. For the medium release the whole tunnel might be affected by a gas cloud and gas clouds longer than 200 m will most likely detonate causing fatalities in the whole tunnel..

9.2.3 BLEVE (boiling liquid expanding vapour explosion)

For outdoor BLEVE accidents, the consequences to people are normally assessed as the extent and duration of the fireball, hence overpressure effects are normally not considered. The fireball is normally modelled as a spherical fireball, assumed to be resting on the ground. The parameter affecting the size of the fireball is the mass of the flammable liquid exploding in a BLEVE. A

BLEVE occurring inside a tunnel will be formed by the tunnel instead of forming a spherical fireball.

In the risk assessment for the Øresund Link ref. [13] the radius of a BLEVE fireball and the consequences of a BLEVE inside the tunnel have been calculated. The model used for the Øresund link is conservative and gives indications of that an accident leading to a BLEVE inside the tunnel, will affect the whole tunnel. It is assumed that a BLEVE in the Fehmarnbelt Fixed Link also will affect the whole tunnel. Based the fact that the Øresund Tunnel is 3.5 km and the Fehmarnbelt Fixed Link Tunnel is 18.4 km this assumption is conservative.

The consequences from a BLEVE are assumed to be the same as for explosion with solid explosives.

10. APPENDIX B – TRAIN DISTRIBUTION IN TUNNEL FROM TIME SCHEDULE

Based on the time schedule for 2025, which is described in ref. [21], an analysis about the train distribution in the tunnel has been carried out.

The timetable data is diverging from the data used in Table 4-4, because of an increased number of trains, see Table 10-1.

Rail Traffic	**2025**
Average number of freight trains per day	97
Average number of passenger trains per day	54

Table 10-1: Expected number of trains per day used in scheduling for the year 2025

Based on the time scheduled it is assessed how often different train scenarios are expected to occur. From the analysis it is seen that there are two trains as a maximum - the combinations are:

- Two freight trains, (freight train followed by a passenger train and passenger train followed by a freight train),
- A single passenger train,
- A single freight train.

The fraction of time spent in each scenario is estimated for each travel direction, and the result is presented in Table 10-2.

Scenario	**Fehmarn direction**	**Lolland direction**
Freight / Freight	1.6%	1.9%
Freight / Passenger	0.0%	1.1%
Passenger / Freight	0.1%	0.0%
Freight	36.5%	32.9%
Passenger	11.9%	10.9%
Total	50.1%	46.9%

Table 10-2: Fraction of different train scenarios

From Table 10-2 it is seen that there are trains in a tunnel in direction of Fehmarn about 50% of the time and about 47% in the direction of Lolland.

11. APPENDIX C – DISTRIBUTIONS OF TRAIN CAPACITY

11.1.1.1 **Passenger trains**

The average number of passengers on passenger trains is estimated to 95 persons, and the number of workers on each train is conservatively set to 3 (Train driver, Train manager and one other), ref.[3]. This gives a total of 98 persons on passengers on trains on average. Based on traffic data from the present travel connection, i.e., passengers on trains driving on board of the ferry between Rødby and Puttgarten, an analysis has been carried out. Data covers a one year period from October 2011 to September 2012.

In Figure 11-1 the distribution of the present train capacities can be seen. Due to the fact that it is expected that the same type and number of trains will be needed in the future, this distribution is assumed to estimate the future distribution very well. It is e.g. seen that 82% of the trains can have 195 passengers on board and a minor fraction (about 0.3%) can have up to 390 passengers.

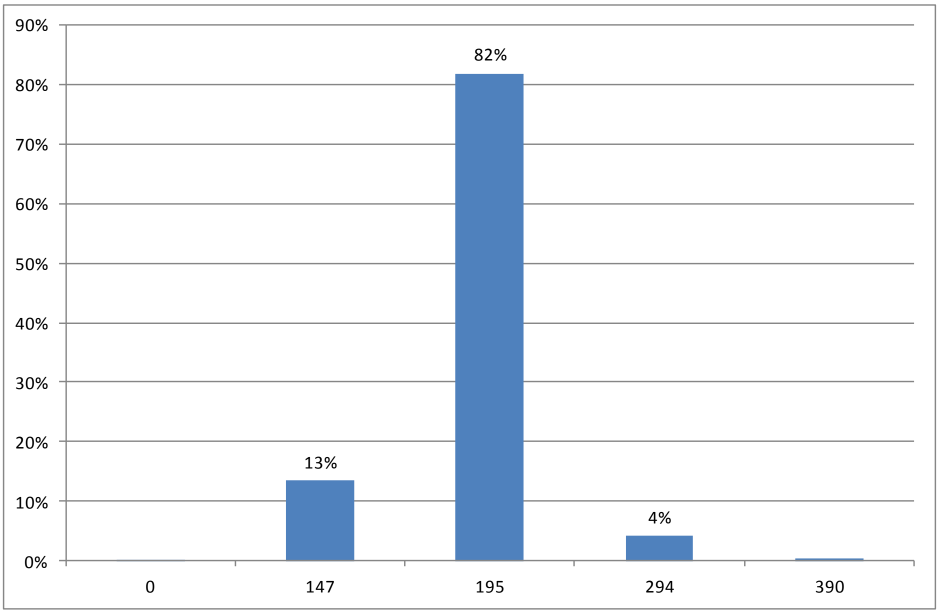

Figure 11-1 Distribution of train capacities

In Figure 11-2 the actual distribution of passengers can be seen. It is seen that it is most likely that there are between 40 and 200 passengers on a train

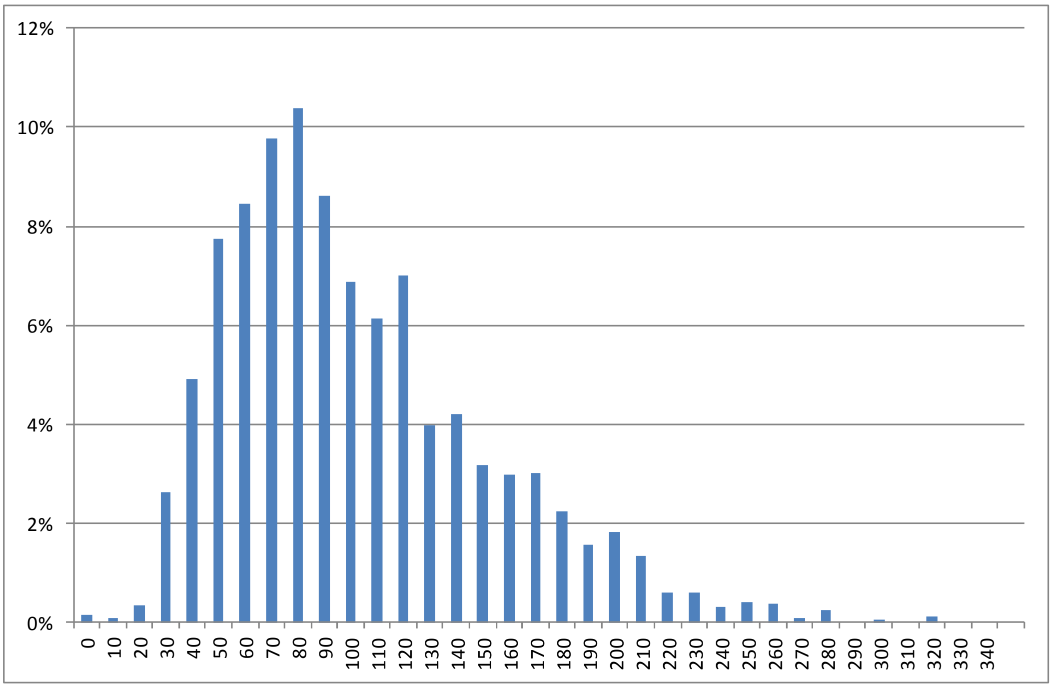

Figure 11-2 Actual distribution of passengers

It is seen that there is only a few number of registrations with trains with more than 260-270 passengers. The maximum number of passengers seen in data is 320. The distribution has been shown in Figure 11-3 together with a fitted distribution.

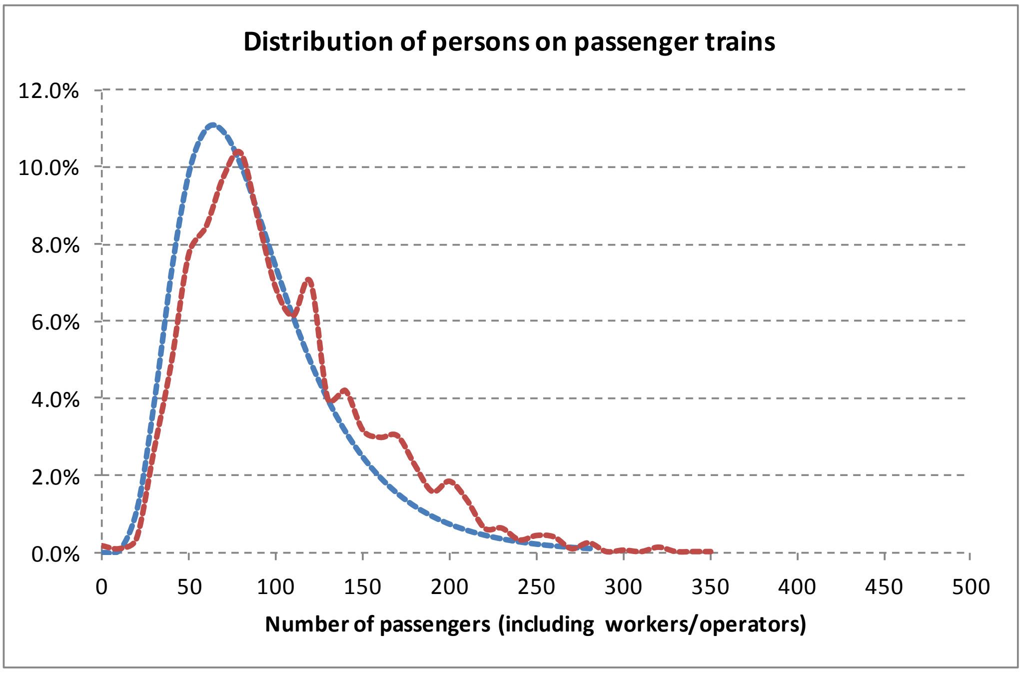

Figure 11-3 Assumed distribution

From the data and the distribution it is seen that it is very unlikely that the number of passengers in a train is larger than 320.

The numbers are presented in Table 11-1.

Intervals (number of passengers)		Cumulative	Distribution
0	**40**	4.8%	4.8%
40	**80**	42.3%	37.5%
80	**100**	61%	18.6%
100	**150**	87%	26.2%
150	**275**	99.2%	12.0%
275	**350**	99.9%	0.76%

Table 11-1 Persons on passenger trains

11.1.1.2 Freight trains

It is assumed; see ref. [3], that the locomotive driver is the only person on the freight train.

12. APPENDIX D – CONSEQUENCE TABLES

12.1 Road accidents resulting in no fire

1.1 - Car accident resulting in no fire								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	95,92%	4,00%	0,08%	0	0	0	0
Average	0,0417	0	4,00E-02	5,91E-03	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	2,50E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.3 - Buss accident resulting in no fire								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	0,0833	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.5 - Truck accident resulting in no fire								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	93,94%	5,87%	0,19%	0	0	0	0
Average	0,0625	0	5,87E-02	1,31E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

12.2 Road accident involving dangerous goods vehicle carrying ammonia

1.1.1 - traffic accident involving dangerous goods vehicle carrying ammonia resulting in no release								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	93,94%	5,87%	0,19%	0	0	0	0
Average	0,0625	0	5,87E-02	1,31E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.1.2 - traffic accident involving dangerous goods vehicle carrying ammonia resulting in small release								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	90,11%	9,39%	0,51%	0	0	0	0
Average	0,1042	0	9,39E-02	3,54E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	9,49E-01	4,94E-02	1,31E-03	0	0	0	0
Average	0,052	0	4,94E-02	9,17E-03	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.1.3 - traffic accident involving dangerous goods vehicle carrying ammonia resulting in medium release								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0,01%	99,99%	0,00%
Average	56,6912	0	0	0	0	2,24E-03	1,00E+02	2,16E-05
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	88,25%	11,03%	0,72%	0	0	0	0
Average	0,1250	0	1,10E-01	5,03E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	9,39E-01	5,87E-02	1,87E-03	0	0	0	0
Average	0,063	0	5,87E-02	1,31E-02	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.1.4 - Traffic accident involving Dangerous goods vehicle carrying Ammonia resulting in Large release								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	95,04%	4,96%
Average	85,0225	0	0	0	0	0	9,50E+01	1,49E+01
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	82,90%	15,54%	1,55%	0	0	0	0
Average	0,1875	0	1,55E-01	1,09E-01	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	9,11E-01	8,54E-02	4,13E-03	0	0	0	0
Average	0,094	0	8,54E-02	2,89E-02	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

12.3 Road accidents involving dangerous good vehicle carrying chlorine

1.2.1 - traffic accident involving dangerous goods vehicle carrying chlorine resulting in no release								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	93,94%	5,87%	0,19%	0	0	0	0
Average	0,0625	0	5,87E-02	1,31E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.2.2 - traffic accident involving dangerous goods vehicle carrying chlorine resulting in small release								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	90,11%	9,39%	0,51%	0	0	0	0
Average	0,1042	0	9,39E-02	3,54E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	9,49E-01	4,94E-02	1,31E-03	0	0	0	0
Average	0,052	0	4,94E-02	9,17E-03	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.2.3 - traffic accident involving dangerous goods vehicle carrying chlorine resulting in medium release								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	11,21%	88,79%
Average	113,3538	0	0	0	0	0	1,12E+01	2,66E+02
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	88,25%	11,03%	0,72%	0	0	0	0
Average	0,1250	0	1,10E-01	5,03E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	9,39E-01	5,87E-02	1,87E-03	0	0	0	0
Average	0,063	0	5,87E-02	1,31E-02	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.2.4 - Traffic accident involving Dangerous goods vehicle carrying Chlorine resulting in Large release								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0,00%	100,00%
Average	170,0164	0	0	0	0	0	4,16E-07	3,00E+02
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	82,90%	15,54%	1,55%	0	0	0	0
Average	0,1875	0	1,55E-01	1,09E-01	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	9,11E-01	8,54E-02	4,13E-03	0	0	0	0
Average	0,094	0	8,54E-02	2,89E-02	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

12.4 Road accidents involving dangerous good vehicle carrying lpg

1.3.1 - traffic accident involving dangerous goods vehicle carrying lpg resulting in no release								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	93,94%	5,87%	0,19%	0	0	0	0
Average	0,0625	0	5,87E-02	1,31E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.3.2 - traffic accident involving dangerous goods vehicle carrying lpg resulting in small release no ignition								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	90,11%	9,39%	0,51%	0	0	0	0
Average	0,1042	0	9,39E-02	3,54E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	9,49E-01	4,94E-02	1,31E-03	0	0	0	0
Average	0,052	0	4,94E-02	9,17E-03	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.3.3 - traffic accident involving dangerous goods vehicle carrying lpg resulting in small release, delayed ignition leading to a explosion								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	215,3177	0	0	0	0	0	0	3,00E+02
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	365,0000	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	5,00E+08	0	0	0	0	0	0	1,00E+09
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	5,14E-01
Average	365,000	0	0	0	0	0	0	1,88E+02
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0

1.3.5 - traffic accident involving dangerous goods vehicle carrying lpg resulting in small release, immediate ignition leading to a bleve								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	215,3177	0	0	0	0	0	0	3,00E+02
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	365,0000	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	5,00E+08	0	0	0	0	0	0	1,00E+09
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	5,14E-01
Average	365,000	0	0	0	0	0	0	1,88E+02
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0

1.3.7 - traffic accident involving dangerous goods vehicle carrying lpg resulting in medium release, no immediate ignition leading to a no ignition								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	88,25%	11,03%	0,72%	0	0	0	0
Average	0,1250	0	1,10E-01	5,03E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	9,39E-01	5,87E-02	1,87E-03	0	0	0	0
Average	0,063	0	5,87E-02	1,31E-02	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.3.8 - traffic accident involving dangerous goods vehicle carrying lpg resulting in medium release, delayed ignition leading to a explosion								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	215,3177	0	0	0	0	0	0	3,00E+02
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	365,0000	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	5,00E+08	0	0	0	0	0	0	1,00E+09
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	5,14E-01
Average	365,000	0	0	0	0	0	0	1,88E+02
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0

1.3.10 - traffic accident involving dangerous goods vehicle carrying lpg resulting in medium release, immediate ignition leading to a bleve								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	215,3177	0	0	0	0	0	0	3,00E+02
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	365,0000	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	5,00E+08	0	0	0	0	0	0	1,00E+09
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	5,14E-01
Average	365,000	0	0	0	0	0	0	1,88E+02
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0

1.3.12 - traffic accident involving dangerous goods vehicle carrying lpg resulting in large release, no immediate ignition leading to a no ignition								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	82,90%	15,54%	1,55%	0	0	0	0
Average	0,1875	0	1,55E-01	1,09E-01	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	9,11E-01	8,54E-02	4,13E-03	0	0	0	0
Average	0,094	0	8,54E-02	2,89E-02	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.3.15 - traffic accident involving dangerous goods vehicle carrying lpg resulting in large release, leading to a immediate ignition - explosion								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	215,3177	0	0	0	0	0	0	3,00E+02
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	365,0000	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	5,00E+08	0	0	0	0	0	0	1,00E+09
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	5,14E-01
Average	365,000	0	0	0	0	0	0	1,88E+02
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0

12.5 Road accidents involving dangerous goods vehicle carrying flammable liquids

1.4.1 - traffic accident involving dangerous goods vehicle carrying flammable liquidsresulting in no release of heptane								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	93,94%	5,87%	0,19%	0	0	0	0
Average	0,0625	0	5,87E-02	1,31E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.4.2 - traffic accident involving dangerous goods vehicle carrying flammable liquids resulting in small heptane release no ignition								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	90,11%	9,39%	0,51%	0	0	0	0
Average	0,1042	0	9,39E-02	3,54E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	9,49E-01	4,94E-02	1,31E-03	0	0	0	0
Average	0,052	0	4,94E-02	9,17E-03	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.4.3 - traffic accident involving dangerous goods vehicle carrying flammable liquids resulting in heptane release, ignition leading to a bleve								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	215,3177	0	0	0	0	0	0	3,00E+02
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	365,0000	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	5,00E+08	0	0	0	0	0	0	1,00E+09
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	5,14E-01
Average	365,000	0	0	0	0	0	0	1,88E+02
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	1,13E-09	2,00E-02	9,80E-01	0
Average	43,473	0	0	0	1,13E-08	6,01E-01	9,80E+01	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	1,13E-09	2,00E-02	9,80E-01	0
Average	43,473	0	0	0	1,13E-08	6,01E-01	9,80E+01	0

1.4.5 - traffic accident involving dangerous goods vehicle carrying flammable liquids resulting in heptane release, medium release leading to a no ignition								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	88,25%	11,03%	0,72%	0	0	0	0
Average	0,1250	0	1,10E-01	5,03E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	9,39E-01	5,87E-02	1,87E-03	0	0	0	0
Average	0,063	0	5,87E-02	1,31E-02	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.4.6 - traffic accident involving dangerous goods vehicle carrying flammable liquids resulting in heptane release, medium release leading to a bleve								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	215,3177	0	0	0	0	0	0	3,00E+02
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	365,0000	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	5,00E+08	0	0	0	0	0	0	1,00E+09
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	5,14E-01
Average	365,000	0	0	0	0	0	0	1,88E+02
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0

1.4.8 - traffic accident involving dangerous goods vehicle carrying flammable liquids resulting in heptane release, large release leading to no ignition								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	82,90%	15,54%	1,55%	0	0	0	0
Average	0,1875	0	1,55E-01	1,09E-01	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	9,11E-01	8,54E-02	4,13E-03	0	0	0	0
Average	0,094	0	8,54E-02	2,89E-02	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.4.9 - traffic accident involving dangerous goods vehicle carrying flammable liquids resulting in heptane release, large release, leading to a ignition								
Fatalities road		**0**	**0**	**0**	**0**	**0**	**0**	**0**
Distribution-type	Poisson	in DGV-fire e	0	0	0	0	0	0
Average	0,0000	0	0	0	0	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0,0000	0	0	0	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0,00E+00	1,00E+03	0	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

12.6 Road accidents involving vehicles carrying explosives

1.5.1 - traffic accident involving dangerous goods vehicle carrying exposives resulting in detonation								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	215,3177	0	0	0	0	0	0	3,00E+02
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	365,0000	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	5,00E+08	0	0	0	0	0	0	1,00E+09
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	5,14E-01
Average	365,000	0	0	0	0	0	0	1,88E+02
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	2,13E-01	3,29E-01	3,86E-01	7,17E-02	7,43E-07	0	0
Average	1,547	0	3,29E-01	1,16E+00	7,17E-01	2,23E-05	0	0

1.5.2 - traffic accident involving dangerous goods vehicle carrying exposives resulting in no detonation								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	93,94%	5,87%	0,19%	0	0	0	0
Average	0,0625	0	5,87E-02	1,31E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

12.7 Road accidents involving vehicles carrying acids and bases

1.6.1 - traffic accident involving dangerous goods vehicle carrying acids and bases resulting in large release								
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	82,90%	15,54%	1,55%	0	0	0	0
Average	0,1875	0	1,55E-01	1,09E-01	0	0	0	0
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		0	1	7	14	30	180	365
Distribution-type	Poisson	9,11E-01	8,54E-02	4,13E-03	0	0	0	0
Average	0,094	0	8,54E-02	2,89E-02	0	0	0	0
Fatalities rail passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		0	1	3	10	30	100	300
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.6.2 - traffic accident involving dangerous goods vehicle carrying acids and bases resulting in medium release								
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	88,25%	11,03%	0,72%	0	0	0	0
Average	0,1250	0	1,10E-01	5,03E-02	0	0	0	0
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		0	1	7	14	30	180	365
Distribution-type	Poisson	9,39E-01	5,87E-02	1,87E-03	0	0	0	0
Average	0,063	0	5,87E-02	1,31E-02	0	0	0	0
Fatalities rail passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		0	1	3	10	30	100	300
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.6.3 - traffic accident involving dangerous goods vehicle carrying acids and bases resulting in small release								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	90,11%	9,39%	0,51%	0	0	0	0
Average	0,1042	0	9,39E-02	3,54E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	9,49E-01	4,94E-02	1,31E-03	0	0	0	0
Average	0,052	0	4,94E-02	9,17E-03	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

1.6.4 - traffic accident involving dangerous goods vehicle carrying acids and bases resulting in no release								
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	97,17%	2,79%	0,04%	0,00%	0	0	0
Average	0,0287	0	2,79E-02	1,21E-03	2,76E-07	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	93,94%	5,87%	0,19%	0	0	0	0
Average	0,0625	0	5,87E-02	1,31E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	100,00%	0	0	0	0	0
Average	5,00E+03	0	1,00E+04	0	0	0	0	0
Disruption rail		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0
Fatalities rail employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	1,00E+00	0	0	0	0	0	0
Average	0,000	0	0	0	0	0	0	0

12.8 Fire Road

Scenario	0	1	3	10	30	100	300	Mean
2.1.2	1,00	0	0	0	0	0	0	0
2.1.3	1,00	0	0	0	0	0	0	0
2.1.4	1,00	0	0	0	0	0	0	0
2.1.5	1,00	0	0	0	0	0	0	0
2.1.6	1,00	0	0	0	0	0	0	0
2.1.7	1,00	0	0	0	0	0	0	0
2.1.8	1,00	0	0	0	0	0	0	0
2.1.9	0,43	0,09	0,27	0,21	0,00	0	0	3,00
2.2.2	1,00	0	0	0	0	0	0	0
2.2.3	1,00	0	0	0	0	0	0	0
2.2.4	1,00	0	0	0	0	0	0	0
2.2.5	1,00	0	0	0	0	0	0	0
2.2.6	1,00	0	0	0	0	0	0	0
2.2.7	1,00	0	0	0	0	0	0	0
2.2.8	1,00	0	0	0	0	0	0	0
2.2.9	0,43	0,09	0,27	0,21	0,00	0	0	3,00
2.3.2	1,00	0	0	0	0	0	0	0
2.3.3	1,00	0	0	0	0	0	0	0
2.3.4	1,00	0	0	0	0	0	0	0
2.3.5	1,00	0	0	0	0	0	0	0
2.3.6	1,00	0	0	0	0	0	0	0
2.3.7	1,00	0	0	0	0	0	0	0
2.3.8	0,40	0,02	0,13	0,43	0,01	0	0	5,00
2.3.9	0,43	0,09	0,27	0,21	0,00	0	0	3,00
2.3.10	1,00	0	0	0	0	0	0	0
2.3.11	1,00	0	0	0	0	0	0	0
2.3.12	1,00	0	0	0	0	0	0	0
2.3.13	1,00	0	0	0	0	0	0	0
2.3.14	1,00	0	0	0	0	0	0	0
2.3.15	1,00	0	0	0	0	0	0	0
2.3.16	1,00	0	0	0	0	0	0	0
2.3.17	0,43	0,09	0,27	0,21	0,00	0	0	3,00
2.4.2	1,00	0	0	0	0	0	0	0
2.4.3	1,00	0	0	0	0	0	0	0
2.4.4	1,00	0	0	0	0	0	0	0
2.4.5	1,00	0	0	0	0	0	0	0
2.4.6	1,00	0	0	0	0	0	0	0
2.4.7	1,00	0	0	0	0	0	0	0
2.4.8	1,00	0	0	0	0	0	0	0
2.4.9	0,43	0,09	0,27	0,21	0,00	0	0	3,00
2.1.1	1,00	0	0	0	0	0	0	0
2.2.1	1,00	0	0	0	0	0	0	0
2.3.1	1,00	0	0	0	0	0	0	0
2.4.1	1,00	0	0	0	0	0	0	0
2.5.1	1,00	0	0	0	0	0	0	0
2.6.1	1,00	0	0	0	0	0	0	0
2.7.1	1,00	0	0	0	0	0	0	0
2.8.1	1,00	0	0	0	0	0	0	0

Repair costs

	Repair costs [Euro] - fire inside enclosed tunnel						
Fire size	**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**	Mean
1	9,44E-01	5,56E-02	0	0	0	0	0	1.500
2,5	7,26E-02	9,27E-01	3,16E-04	0	0	0	0	9.375
8	0	5,05E-02	9,49E-01	6,09E-04	0	0	0	96.000
15	0	1,10E-05	7,36E-01	2,64E-01	1,84E-08	0	0	337.500
20	0	2,66E-07	4,44E-01	5,56E-01	1,10E-06	0	0	600.000
30	0	0	9,30E-04	9,60E-01	3,90E-02	0	0	1.350.000
50	0	0	0	5,16E-04	9,44E-01	5,56E-02	0	15.000.000
200	0	0	0	2,66E-07	4,44E-01	5,56E-01	1,10E-06	60.000.000
350	0	0	0	0	8,53E-03	9,85E-01	6,41E-03	105.000.000

	Repair costs [Euro] - fire on landsides							**Mean**
Fire size	**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**	
1	1,00E+00	0	0	0	0	0	0	1.000
2,5	1,00E+00	0	0	0	0	0	0	1.000
15	1,10E-05	7,36E-01	2,64E-01	1,84E-08	0	0	0	33.750
30	0	9,30E-04	9,60E-01	3,90E-02	0	0	0	135.000
200	0	0	2,66E-07	4,44E-01	5,56E-01	1,10E-06	0	6.000.000
350	0	0	0	8,53E-03	9,85E-01	6,41E-03	0	10.500.000

Disruption

	Disruption [days] - fire inside enclosed tunnel - Incident tube							
Fire size	**0**	**1**	**7**	**14**	**30**	**180**	**365**	**Mean**
1	8,73E-01	1,14E-01	1,22E-02	0	0	0	0	0,20
2,5	8,11E-01	1,53E-01	3,52E-02	6,52E-09	0	0	0	0,40
8	7,71E-01	1,67E-01	6,18E-02	1,24E-07	0	0	0	0,60
15	7,15E-01	1,66E-01	1,19E-01	4,62E-06	0	0	0	1,00
20	4,22E-01	4,32E-02	5,05E-01	3,01E-02	1,17E-05	0	0	4,00
30	2,90E-01	4,53E-03	4,20E-01	2,81E-01	4,06E-03	0	0	7,00
50	6,93E-01	0	1,61E-07	2,82E-04	1,68E-01	1,39E-01	0	30,00
200	5,00E-01	0	0	0	0	5,00E-01	0	90,00
350	5,00E-01	0	0	0	0	5,00E-01	0	90,00

	Disruption [days] - fire inside enclosed tunnel - Non incident tube							
Fire size	**0**	**1**	**7**	**14**	**30**	**180**	**365**	**Mean**
1	9,63E-01	3,63E-02	7,67E-04	0	0	0	0	0,04
2,5	9,33E-01	6,41E-02	2,75E-03	0	0	0	0	0,08
8	9,09E-01	8,58E-02	5,60E-03	0	0	0	0	0,13
15	8,55E-01	1,28E-01	1,74E-02	0	0	0	0	0,25
20	8,29E-01	1,44E-01	2,70E-02	1,70E-09	0	0	0	0,33
30	7,90E-01	1,62E-01	4,83E-02	3,33E-08	0	0	0	0,50
50	4,65E-01	5,83E-02	4,62E-01	1,48E-02	2,35E-06	0	0	3,50
200	2,90E-01	4,53E-03	4,20E-01	2,81E-01	4,06E-03	0	0	7,00
350	2,90E-01	4,53E-03	4,20E-01	2,81E-01	4,06E-03	0	0	7,00

	Disruption [days] - fire on landsides							
Fire size	**0**	**1**	**7**	**14**	**30**	**180**	**365**	**Mean**
1	8,73E-01	1,14E-01	1,22E-02	0	0	0	0	0,20
2,5	8,11E-01	1,53E-01	3,52E-02	6,52E-09	0	0	0	0,40
15	7,90E-01	1,62E-01	4,83E-02	3,33E-08	0	0	0	0,50
30	6,60E-01	1,46E-01	1,93E-01	7,41E-05	0	0	0	1,50
200	6,10E-01	1,22E-01	2,67E-01	4,94E-04	1,75E-09	0	0	2,00
350	6,10E-01	1,22E-01	2,67E-01	4,94E-04	1,75E-09	0	0	2,00

12.9 Train Collision

3.0 - No severe collision								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	100,00%	0	0	0	0
Average	**5,00E+04**	0	0	1,00E+05	0	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1 - Front- Front - Train collision with one passenger train and one freight train not carrying dangerous goods								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0,00%	0,04%	0,81%	54,20%	44,95%	0,00%	0
Average	**10,26**	0	3,59E-04	2,44E-02	5,42E+00	1,35E+01	1,38E-05	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	29,00%	35,90%	31,39%	3,72%	0,00%	0	0
Average	**1,238**	0	3,59E-01	9,42E-01	3,72E-01	2,54E-06	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3 - Front- Front - Train collision with two freight trains not carrying dangerous goods								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	36,79%	36,79%	24,53%	1,90%	0,00%	0	0
Average	**1**	0	3,68E-01	7,36E-01	1,90E-01	3,01E-07	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.5 - Front- Front - Train collision with two passenger trains								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0,00%	0,04%	0,81%	54,20%	44,95%	0,00%	0
Average	**10,26**	0	3,59E-04	2,44E-02	5,42E+00	1,35E+01	1,38E-05	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	27,47%	35,49%	32,80%	4,23%	0,00%	0	0
Average	**1,292**	0	3,55E-01	9,84E-01	4,23E-01	3,87E-06	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	4,98%	14,94%	78,89%	1,19%	0,00%	0	0
Average	**3,00E+00**	0	1,49E-01	5,52E+00	1,67E-01	2,01E-05	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	50,03%	49,97%	0	0
Average	**1,00E+06**	0	0	0	5,00E+05	5,00E+06	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.6 - Front- End - Train collision with one passenger train and one freight train not carrying dangerous goods								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0,59%	3,04%	21,10%	73,65%	1,62%	0	0
Average	**5,13**	0	3,04E-02	6,33E-01	7,37E+00	4,86E-01	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	53,85%	33,33%	12,44%	0,37%	0	0	0
Average	**0,619**	0	3,33E-01	3,73E-01	3,75E-02	2,18E-09	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.7 - Front- End- Train collision with two freight trains not carrying dangerous goods								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	55,32%	32,75%	11,61%	0,32%	0	0	0
Average	**0,592**	0	3,28E-01	3,48E-01	3,20E-02	1,37E-09	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.9 - Front- End - Train collision with two passenger trains								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0,59%	3,04%	21,10%	73,65%	1,62%	0	0
Average	**5,13**	0	3,04E-02	6,33E-01	7,37E+00	4,86E-01	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	52,41%	33,86%	13,29%	0,44%	0	0	0
Average	**0,646**	0	3,39E-01	3,99E-01	4,35E-02	3,40E-09	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	50,08%	49,92%	0	0	0
Average	**1,00E+05**	0	0	5,01E+04	4,99E+05	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.1 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving ammonia resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.2 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving ammonia resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.3 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving ammonia resulting in medium release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0,00%	0,00%	0,13%	91,17%	8,71%	0
Average	**23,75**	0	1,15E-09	3,66E-07	1,26E-02	2,74E+01	8,71E+00	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	47,24%	35,43%	16,61%	0,73%	0	0	0
Average	**0,75**	0	3,54E-01	4,98E-01	7,29E-02	1,60E-08	0	0
Disruption		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	4,98%	14,94%	44,81%	35,25%	0,03%	0	0
Average	**3,00E+00**	0	1,49E-01	1,34E+00	3,52E+00	8,77E-03	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	71,65%	23,88%	4,42%	0,04%	0	0	0
Average	**3,33E-01**	0	2,39E-01	1,33E-01	3,95E-03	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.4 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving ammonia resulting in large release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0,00%	19,72%	80,28%	0
Average	**35,625**	0	0	0	4,20E-06	5,91E+00	8,03E+01	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	32,47%	36,52%	28,25%	2,76%	0,00%	0	0
Average	**1,125**	0	3,65E-01	8,47E-01	2,76E-01	9,83E-07	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	4,98%	14,94%	78,89%	1,19%	0,00%	0	0
Average	**3,00E+00**	0	1,49E-01	5,52E+00	1,67E-01	2,01E-05	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.5 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving chlorine resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	13,53%	27,07%	45,11%	14,29%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	1,35E+00	1,43E+00	2,49E-04	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	71,65%	23,88%	4,42%	0,04%	0	0	0
Average	**3,33E-01**	0	2,39E-01	1,33E-01	3,95E-03	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.6 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving chlorine resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.7 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving chlorine resulting in medium release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0,00%	0,00%	0,13%	91,17%	8,71%	0
Average	**23,75**	0	1,15E-09	3,66E-07	1,26E-02	2,74E+01	8,71E+00	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	47,24%	35,43%	16,61%	0,73%	0	0	0
Average	**0,75**	0	3,54E-01	4,98E-01	7,29E-02	1,60E-08	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	4,98%	14,94%	78,89%	1,19%	0,00%	0	0
Average	**3,00E+00**	0	1,49E-01	5,52E+00	1,67E-01	2,01E-05	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.8 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving chlorine resulting in large release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0,00%	19,72%	80,28%	0
Average	**35,625**	0	0	0	4,20E-06	5,91E+00	8,03E+01	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	32,47%	36,52%	28,25%	2,76%	0,00%	0	0
Average	**1,125**	0	3,65E-01	8,47E-01	2,76E-01	9,83E-07	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	4,98%	14,94%	78,89%	1,19%	0,00%	0	0
Average	**3,00E+00**	0	1,49E-01	5,52E+00	1,67E-01	2,01E-05	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.9 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving flammable resulting in no release of heptane								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.10 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving flammable resulting in small release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0,00%	100,00%	0
Average	**7,20E+01**	0	0	0	0	5,39E-07	1,80E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.11 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving flammable resulting in small release, ignition and bleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	**90,25**	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	**2,85**	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.1.13 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving flammable resulting in medium release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0,00%	100,00%	0
Average	**7,20E+01**	0	0	0	0	5,39E-07	1,80E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.14 - front- end - train collision with one passenger train and one freight train carrying dangerous good resulting in train accident involving flammable liquids and medium release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	**90,25**	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	**2,85**	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.1.16 - front- front - train collision with one passenger train and one freight train carrying dangerous goods involving flammable liquids resulting in large release leading to no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0,00%	100,00%	0
Average	**7,20E+01**	0	0	0	0	5,39E-07	1,80E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.18 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving lpg resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.19 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving lpg resulting in small release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0,00%	100,00%	0
Average	**7,20E+01**	0	0	0	0	5,39E-07	1,80E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.20 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving lpg,small release resulting in delayed ignition and explosion								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	**90,25**	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	**2,85**	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.1.22 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving lpg,small release resulting in immediate ignition and bleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	**90,25**	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	**2,85**	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.1.24 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving lpg,medium release resulting in no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0,00%	100,00%	0
Average	**7,20E+01**	0	0	0	0	5,39E-07	1,80E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.25 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving lpg,medium release resulting in delayed ignition and explosion								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	**90,25**	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	**2,85**	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.1.27 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving lpg,medium release resulting in immediate ignition and bleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	**90,25**	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	**2,85**	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.1.29 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving lpg, large release resulting in no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0,00%	100,00%	0
Average	**7,20E+01**	0	0	0	0	5,39E-07	1,80E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.30 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving lpg,large release resulting in delayed ignition and explosion								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	**90,25**	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	**2,85**	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.1.33 - front- front - train collision with one passenger train and one freight train carrying dangerous g involving acid and resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.34 - front- front - train collision with one passenger train and one freight train carrying dangerous goods involving acid and resulting in small release								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.35 - front- front - train collision with one passenger train and one freight train carrying dangerous goods involving acid and resulting in medium release								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	4,98%	14,94%	78,89%	1,19%	0,00%	0	0
Average	**3,00E+00**	0	1,49E-01	5,52E+00	1,67E-01	2,01E-05	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.1.36 - front- front - train collision with one passenger train and one freight train carrying dangerous goods involving acid and resulting in large release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	4,98%	14,94%	78,89%	1,19%	0,00%	0	0
Average	**3,00E+00**	0	1,49E-01	5,52E+00	1,67E-01	2,01E-05	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

12.10 Train collision involving dangerous goods

3.2.1 - front- front - train collision with two freight trains carrying dangerous goods involving ammonia resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.2 - front- front - train collision with two freight trains carrying dangerous goods involving ammonia resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	**4,80E+01**	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.3 - front- front - train collision with two freight trains carrying dangerous goods involving ammonia resulting in medium release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	60,65%	30,33%	8,85%	0,18%	0	0	0
Average	**0,5**	0	3,03E-01	2,65E-01	1,75E-02	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	**4,80E+01**	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.4 - front- front - train collision with two freight trains carrying dangerous goods involving ammonia resulting in large release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	47,24%	35,43%	16,61%	0,73%	0	0	0
Average	**0,75**	0	3,54E-01	4,98E-01	7,29E-02	1,60E-08	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	**4,80E+01**	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.5 - front- front - train collision with two freight trains carrying dangerous goods involving chlorine resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.6 - front- front - train collision with two freight trains carrying dangerous goods involving chlorine resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	**4,80E+01**	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.7 - front- front - train collision with two freight trains carrying dangerous goods involving chlorine resulting in medium release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	60,65%	30,33%	8,85%	0,18%	0	0	0
Average	**0,5**	0	3,03E-01	2,65E-01	1,75E-02	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	**4,80E+01**	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.8 - front- front - train collision with two freight trains carrying dangerous goods involving chlorine resulting in large release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	47,24%	35,43%	16,61%	0,73%	0	0	0
Average	**0,75**	0	3,54E-01	4,98E-01	7,29E-02	1,60E-08	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	**4,80E+01**	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.9 - front- front - train collision with two freight trains carrying dangerous goods involving flammable resulting in no release of heptane								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.10 - front- front - train collision with two freight trains carrying dangerous goods involving flammable resulting in small release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	**4,80E+01**	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.11 - front- front - train collision with two freight trains carrying dangerous goods involving flammable resulting in small release, ignition and bleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	**1,9**	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.2.13 - front- front - train collision with two freight trains carrying dangerous goods involving flammable resulting in medium release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.14 - front- front - train collision with two freight trains carrying dangerous goodsheptane release resulting in medium release ignition leading tobleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	**1,9**	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.2.16 - front- front - train collision with two freight trains carrying dangerous goods involving flammable resulting in large release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	**4,80E+01**	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.18 - front- front - train collision with two freight trains carrying dangerous goods involving lpg resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.19 - front- front - train collision with two freight trains carrying dangerous goods involving lpg resulting in small release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	**4,80E+01**	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.20 - front- front - train collision with two freight trains carrying dangerous goods involving lpg,small release resulting in delayed ignition and explosion								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	**1,9**	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.2.22 - front- front - train collision with two freight trains carrying dangerous goods involving lpg,small release resulting in immediate ignition and bleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	**1,9**	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.2.24 - front- front - train collision with two freight trains carrying dangerous goods involving lpg,medium release resulting in no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0,00%	100,00%	0
Average	**7,20E+01**	0	0	0	0	5,39E-07	1,80E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.25 - front- front - train collision with two freight trains carrying dangerous goods involving lpg,medium release resulting in delayed ignition and explosion								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	**1,9**	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.2.27 - front- front - train collision with two freight trains carrying dangerous goods involving lpg,medium release resulting in immediate ignition and bleve								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	1,9	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	3,65E+02	0	0	0	0	0	0	1,88E+02
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	5,00E+06	0	0	0	0	1,00E+07	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	4,17E-01	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	2,15E+02	0	0	0	0	0	0	3,00E+02

3.2.29 - front- front - train collision with two freight trains carrying dangerous goods involving lpg, large release resulting in no ignition								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	4,80E+01	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	5,00E+06	0	0	0	0	1,00E+07	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	4,17E-01	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0

3.2.30 - front- front - train collision with two freight trains carrying dangerous goods involving lpg,large release resulting in delayed ignition and explosion								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	**1,9**	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.2.33 - front- front - train collision with two freight trains carrying dangerous goods involving acid and resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.34 - front- front - train collision with two freight trains carrying dangerous goods involving acid and resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.35 - front- front - train collision with two freight trains carrying dangerous goods involving acid and resulting in medium release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.2.36 - front- front - train collision with two freight trains carrying dangerous goods involving acid and resulting in large release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.1 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving ammonia resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.2 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving ammonia resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.3 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving ammonia resulting in medium release								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0,00%	0,00%	0,13%	91,17%	8,71%	0
Average	23,75	0	1,15E-09	3,66E-07	1,26E-02	2,74E+01	8,71E+00	0
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	47,24%	35,43%	16,61%	0,73%	0	0	0
Average	0,75	0	3,54E-01	4,98E-01	7,29E-02	1,60E-08	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	2,00E+00	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	5,00E+05	0	0	0	1,00E+06	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	2,50E-01	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0

3.3.4 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving ammonia resulting in large release								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0	0	0,00%	19,72%	80,28%	0
Average	35,625	0	0	0	4,20E-06	5,91E+00	8,03E+01	0
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	32,47%	36,52%	28,25%	2,76%	0,00%	0	0
Average	1,125	0	3,65E-01	8,47E-01	2,76E-01	9,83E-07	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	2,00E+00	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	5,00E+05	0	0	0	1,00E+06	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	2,50E-01	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0

3.3.5 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving chlorine resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.6 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving chlorine resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.7 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving chlorine resulting in medium release								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0,00%	0,00%	0,13%	91,17%	8,71%	0
Average	23,75	0	1,15E-09	3,66E-07	1,26E-02	2,74E+01	8,71E+00	0
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	47,24%	35,43%	16,61%	0,73%	0	0	0
Average	0,75	0	3,54E-01	4,98E-01	7,29E-02	1,60E-08	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	2,00E+00	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	5,00E+05	0	0	0	1,00E+06	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	2,50E-01	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0

3.3.8 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving chlorine resulting in large release								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0	0	0,00%	19,72%	80,28%	0
Average	35,625	0	0	0	4,20E-06	5,91E+00	8,03E+01	0
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	32,47%	36,52%	28,25%	2,76%	0,00%	0	0
Average	1,125	0	3,65E-01	8,47E-01	2,76E-01	9,83E-07	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	2,00E+00	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	5,00E+05	0	0	0	1,00E+06	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	2,50E-01	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0

3.3.9 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving flammable resulting in no release of heptane								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.10 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving flammable resulting in small release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.11 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving flammable resulting in small release, ignition and bleve								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	90,25	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	2,85	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	3,65E+02	0	0	0	0	0	0	1,88E+02
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	5,00E+05	0	0	0	1,00E+06	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	2,50E-01	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	2,15E+02	0	0	0	0	0	0	3,00E+02

3.3.13 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving flammable resulting in medium release and no ignition								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	2,00E+00	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	5,00E+05	0	0	0	1,00E+06	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	2,50E-01	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0

3.3.14 - front- end - train collision with one passenger train and one freight train carrying dangerous good resulting in train accident involving flammable liquids and medium release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	**90,25**	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	**2,85**	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.3.16 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving flammable resulting in large release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.18 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving lpg resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.19 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving lpg resulting in small release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	**4,80E+01**	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.20 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving lpg,small release resulting in delayed ignition and explosion								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	90,25	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	2,85	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	3,65E+02	0	0	0	0	0	0	1,88E+02
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	5,00E+05	0	0	0	1,00E+06	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	2,50E-01	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	2,15E+02	0	0	0	0	0	0	3,00E+02

3.3.22 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving lpg,small release resulting in immediate ignition and bleve								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	90,25	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	2,85	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	3,65E+02	0	0	0	0	0	0	1,88E+02
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	5,00E+05	0	0	0	1,00E+06	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	2,50E-01	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	2,15E+02	0	0	0	0	0	0	3,00E+02

3.3.24 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving lpg,medium release resulting in no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	**4,80E+01**	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.25 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving lpg,medium release resulting in delayed ignition and explosion								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	**90,25**	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	**2,85**	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.3.27 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving lpg,medium release resulting in immediate ignition and bleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	**90,25**	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	**2,85**	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.3.29 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving lpg, large release resulting in no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0,00%	100,00%	0
Average	**7,20E+01**	0	0	0	0	5,39E-07	1,80E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.30 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving lpg,large release resulting in delayed ignition and explosion								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0	0	0	0	85,92%	14,08%
Average	**90,25**	0	0	0	0	0	8,59E+01	4,22E+01
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	5,78%	16,49%	45,81%	31,90%	0,02%	0	0
Average	**2,85**	0	1,65E-01	1,37E+00	3,19E+00	5,71E-03	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.3.33 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving acid and resulting in no release								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.34 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving acid and resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.35 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving acid and resulting in 0.32967								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	13,53%	27,07%	59,29%	0,11%	0,00%	0	0
Average	**2,00E+00**	0	2,71E-01	4,15E+00	1,54E-02	1,16E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.3.36 - front- end - train collision with one passenger train and one freight train carrying dangerous good involving acid and resulting in large release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	77,88%	19,47%	2,65%	0	0	0	0
Average	**2,50E-01**	0	1,95E-01	1,85E-01	4,24E-09	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.1 - front- end - train collision with two freight trains carrying dangerous goods involving ammonia resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.2 - front- end - train collision with two freight trains carrying dangerous goods involving ammonia resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.3 - front- end - train collision with two freight trains carrying dangerous goods involving ammonia resulting in medium release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	60,65%	30,33%	8,85%	0,18%	0	0	0
Average	**0,5**	0	3,03E-01	2,65E-01	1,75E-02	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.4 - front- end - train collision with two freight trains carrying dangerous goods involving ammonia resulting in large release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	47,24%	35,43%	16,61%	0,73%	0	0	0
Average	**0,75**	0	3,54E-01	4,98E-01	7,29E-02	1,60E-08	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.5 - front- end - train collision with two freight trains carrying dangerous goods involving chlorine resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.6 - front- end - train collision with two freight trains carrying dangerous goods involving chlorine resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.7 - front- end - train collision with two freight trains carrying dangerous goods involving chlorine resulting in medium release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	60,65%	30,33%	8,85%	0,18%	0	0	0
Average	**0,5**	0	3,03E-01	2,65E-01	1,75E-02	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.8 - front- end - train collision with two freight trains carrying dangerous goods involving chlorine resulting in large release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	47,24%	35,43%	16,61%	0,73%	0	0	0
Average	**0,75**	0	3,54E-01	4,98E-01	7,29E-02	1,60E-08	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.9 - front- end - train collision with two freight trains carrying dangerous goods involving flammable resulting in no release of heptane								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.10 - front- end - train collision with two freight trains carrying dangerous goods involving flammable resulting in small release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0,00%	1,98%	88,43%	9,58%	0
Average	**2,40E+01**	0	0	3,32E-04	2,77E-01	2,65E+01	1,73E+01	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.11 - front- end - train collision with two freight trains carrying dangerous goods involving flammable resulting in small release, ignition and bleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	**1,9**	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.4.13 - front- end - train collision with two freight trains carrying dangerous goods involving flammable resulting in medium release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0,00%	1,98%	88,43%	9,58%	0
Average	**2,40E+01**	0	0	3,32E-04	2,77E-01	2,65E+01	1,73E+01	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.14 - front- end - train collision with two freight trains carrying dangerous goods resulting in train accident involving flammable liquids and medium release ignition leading tobleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	**1,9**	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.4.16 - front- end - train collision with two freight trains carrying dangerous goods involving flammable resulting in large release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0,00%	1,98%	88,43%	9,58%	0
Average	**2,40E+01**	0	0	3,32E-04	2,77E-01	2,65E+01	1,73E+01	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.18 - front- end - train collision with two freight trains carrying dangerous goods involving lpg resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	36,79%	36,79%	24,53%	1,90%	0,00%	0	0
Average	**1,00E+00**	0	3,68E-01	7,36E-01	1,90E-01	3,01E-07	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0,00%	0	0	0
Average	**1,67E-01**	0	1,41E-01	3,72E-02	2,81E-04	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.19 - front- end - train collision with two freight trains carrying dangerous goods involving lpg resulting in small release and no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0,00%	1,98%	88,43%	9,58%	0
Average	**2,40E+01**	0	0	3,32E-04	2,77E-01	2,65E+01	1,73E+01	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.20 - front- end - train collision with two freight trains carrying dangerous goods involving lpg,small release resulting in delayed ignition and explosion								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	1,9	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	3,65E+02	0	0	0	0	0	0	1,88E+02
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	5,00E+05	0	0	0	1,00E+06	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	1,67E-01	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	2,15E+02	0	0	0	0	0	0	3,00E+02

3.4.22 - front- end - train collision with two freight trains carrying dangerous goods involving lpg,small release resulting in immediate ignition and bleve								
Fatalities passengers		0	1	3	10	30	100	300
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	0	0	0	0	0	0	0	0
Fatalities employees		0	1	3	10	30	100	300
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	1,9	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		0	1	7	14	30	180	365
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	3,65E+02	0	0	0	0	0	0	1,88E+02
Repair costs		1,00E+03	1,00E+04	1,00E+05	1,00E+06	1,00E+07	1,00E+08	1,00E+09
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	5,00E+05	0	0	0	1,00E+06	0	0	0
Disruption road		0	1	7	14	30	180	365
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	1,67E-01	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		0	1	3	10	30	100	300
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	2,15E+02	0	0	0	0	0	0	3,00E+02

3.4.24 - front- end - train collision with two freight trains carrying dangerous goods involving lpg,medium release resulting in no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	**4,80E+01**	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.25 - front- end - train collision with two freight trains carrying dangerous goods involving lpg,medium release resulting in delayed ignition and explosion								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	**1,9**	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	0,03%
Average	**3,65E+02**	0	0	0	0	0	0	7,67E-02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0,00%	0	0	0
Average	**1,67E-01**	0	1,41E-01	3,72E-02	2,81E-04	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.4.27 - front- end - train collision with two freight trains carrying dangerous goods involving lpg,medium release resulting in immediate ignition and bleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	**1,9**	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.4.29 - front- end - train collision with two freight trains carrying dangerous goods involving lpg, large release resulting in no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0,00%	0,36%	99,64%	0
Average	**4,80E+01**	0	0	0	1,10E-07	1,09E-01	1,79E+02	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.30 - front- end - train collision with two freight trains carrying dangerous goods involving lpg,large release resulting in delayed ignition and explosion								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	14,96%	28,42%	44,10%	12,53%	0,00%	0	0
Average	**1,9**	0	2,84E-01	1,32E+00	1,25E+00	1,55E-04	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

3.4.33 - front- end - train collision with two freight trains carrying dangerous goods involving acid and resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.34 - front- end - train collision with two freight trains carrying dangerous goods involving acid and resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.35 - front- end - train collision with two freight trains carrying dangerous goods involving acid and resulting in medium release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

3.4.36 - front- end - train collision with two freight trains carrying dangerous goods involving acid and resulting in large release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	84,65%	14,11%	1,24%	0	0	0	0
Average	**1,67E-01**	0	1,41E-01	8,71E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

12.11 Train derailment

4.1 - train derailment involving passenger train resulting in no severe derailment								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	50,27%	49,73%	0	0	0	0
Average	**1,00E+04**	0	5,03E+03	4,97E+04	0	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.2 - train derailment involving passenger train resulting in severe derailment and no fire								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0,03%	0,21%	3,30%	75,33%	21,13%	0,00%	0
Average	**8,265**	0	2,13E-03	9,90E-02	7,53E+00	6,34E+00	1,14E-07	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	52,94%	33,67%	12,98%	0,41%	0	0	0
Average	**0,636**	0	3,37E-01	3,89E-01	4,12E-02	2,89E-09	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.4 - train derailment involving freight train resulting in not severe derailment								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	50,27%	49,73%	0	0	0	0
Average	**1,00E+04**	0	5,03E+03	4,97E+04	0	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	95,92%	4,00%	0,08%	0	0	0	0
Average	**4,17E-02**	0	4,00E-02	5,91E-03	0	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.5 - train derailment involving freight train resulting in severe derailment, no dangerous goods invloved and no fire								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	57,75%	31,71%	10,30%	0,24%	0	0	0
Average	**0,549**	0	3,17E-01	3,09E-01	2,45E-02	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.1.1 - train derailment involving dangerous goods vehicle carrying lpg resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.1.2 - train derailment involving dangerous goods vehicle carrying lpg resulting in small release no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.1.3 - train derailment involving dangerous goods vehicle carrying lpg resulting in small releasedelayed ignition leading to a explosion								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	38,67%	36,74%	22,98%	1,61%	0,00%	0	0
Average	**0,95**	0	3,67E-01	6,89E-01	1,61E-01	1,79E-07	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**5,00E+08**	0	0	0	0	0	0	1,00E+09
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

4.1.5 - train derailment involving dangerous goods vehicle carrying lpg small release resulting in immediate ignition leading to bleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	38,67%	36,74%	22,98%	1,61%	0,00%	0	0
Average	**0,95**	0	3,67E-01	6,89E-01	1,61E-01	1,79E-07	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	100,00%	0	0	0
Average	**5,00E+05**	0	0	0	1,00E+06	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

4.1.7 - train derailment involving dangerous goods vehicle carrying lpg resulting in medium release, no immediate ignition leading to no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.1.8 - train derailment involving dangerous goods vehicle carrying lpg resulting in medium release no immediate ignition leading to delayed ignition and explosion								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	38,67%	36,74%	22,98%	1,61%	0,00%	0	0
Average	**0,95**	0	3,67E-01	6,89E-01	1,61E-01	1,79E-07	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**1,00E-02**	1,00E+03	0	0	0	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

4.1.10 - train derailment involving dangerous goods vehicle carrying lpg resulting in medium release, immediate ignition and bleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	38,67%	36,74%	22,98%	1,61%	0,00%	0	0
Average	**0,95**	0	3,67E-01	6,89E-01	1,61E-01	1,79E-07	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**1,00E-01**	1,00E+03	0	0	0	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

4.1.12 - train derailment involving dangerous goods vehicle carrying lpg resulting in large release leading to no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.1.13 - train derailment involving dangerous goods vehicle carrying lpg resulting inlarge release, no immediate ignition leading to delayed ignition and explosion								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	38,67%	36,74%	22,98%	1,61%	0,00%	0	0
Average	**0,95**	0	3,67E-01	6,89E-01	1,61E-01	1,79E-07	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**5,00E+00**	1,00E+03	0	0	0	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

4.2.1 - train derailment involving dangerous goods vehicle carrying ammonia resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.2.2 - train derailment involving dangerous goods vehicle carrying ammonia resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.2.3 - train derailment involving dangerous goods vehicle carrying ammonia resulting in medium release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	77,88%	19,47%	2,64%	0,01%	0	0	0
Average	**0,25**	0	1,95E-01	7,91E-02	1,33E-03	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.2.4 - train derailment involving dangerous goods vehicle carrying ammonia resulting in large release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	68,73%	25,77%	5,44%	0,06%	0	0	0
Average	**0,375**	0	2,58E-01	1,63E-01	6,12E-03	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.3.1 - train derailment involving dangerous goods vehicle carrying ammonia resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.3.2 - train derailment involving dangerous goods vehicle carrying ammonia resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.3.3 - train derailment involving dangerous goods vehicle carrying ammonia resulting in medium release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	77,88%	19,47%	2,64%	0,01%	0	0	0
Average	**0,25**	0	1,95E-01	7,91E-02	1,33E-03	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.3.4 - train derailment involving dangerous goods vehicle carrying ammonia resulting in large release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	68,73%	25,77%	5,44%	0,06%	0	0	0
Average	**0,375**	0	2,58E-01	1,63E-01	6,12E-03	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.4.1 - train derailment involving dangerous goods vehicle carrying acids resulting in no release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.4.2 - train derailment involving dangerous goods vehicle carrying acids resulting in small release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.4.3 - train derailment involving dangerous goods vehicle carrying acids resulting in medium release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	92,00%	7,67%	0,33%	0	0	0	0
Average	**8,33E-02**	0	7,67E-02	2,30E-02	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.4.4 - train derailment involving dangerous goods vehicle carrying acids resulting in large release								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.5.1 - train derailment involving dangerous goods vehicle carrying flammable liquids resulting in no release of heptane								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	71,65%	23,88%	4,46%	0,00%	0	0	0
Average	**3,33E-01**	0	2,39E-01	3,12E-01	3,94E-08	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.5.2 - train derailment involving dangerous goods vehicle carrying flammable liquids resulting in small release no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.5.3 - train derailment involving dangerous goods vehicle carrying flammable liquids resulting in small release ignition leading to a bleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	38,67%	36,74%	22,98%	1,61%	0,00%	0	0
Average	**0,95**	0	3,67E-01	6,89E-01	1,61E-01	1,79E-07	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	36,79%	36,79%	26,42%	0,00%	0	0	0
Average	**1,00E+00**	0	3,68E-01	1,85E+00	1,43E-04	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	1,00E+03	0	0	0	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

4.5.5 - train derailment involving dangerous goods vehicle carrying flammable liquids resulting in medium release leading to no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

4.5.6 - train derailment involving dangerous goods vehicle carrying flammable liquids resulting in medium release leading to ignition and bleve								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	38,67%	36,74%	22,98%	1,61%	0,00%	0	0
Average	**0,95**	0	3,67E-01	6,89E-01	1,61E-01	1,79E-07	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	1,00E+03	0	0	0	0	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	0	0	0	0	0	0	51,39%
Average	**3,65E+02**	0	0	0	0	0	0	1,88E+02
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	0	0	0	0	0	0	100,00%
Average	**2,15E+02**	0	0	0	0	0	0	3,00E+02

4.5.8 - train derailment involving dangerous goods vehicle carrying flammable liquids resulting in large release leading to no ignition								
Fatalities passengers		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Fatalities employees		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0
Disruption		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	4,98%	14,94%	78,89%	1,19%	0,00%	0	0
Average	**3,00E+00**	0	1,49E-01	5,52E+00	1,67E-01	2,01E-05	0	0
Repair costs		**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**
Distribution-type	Poisson	0	0	0	0	100,00%	0	0
Average	**5,00E+06**	0	0	0	0	1,00E+07	0	0
Disruption road		**0**	**1**	**7**	**14**	**30**	**180**	**365**
Distribution-type	Poisson	65,92%	27,47%	6,61%	0,00%	0	0	0
Average	**4,17E-01**	0	2,75E-01	4,63E-01	2,18E-07	0	0	0
Fatalities road		**0**	**1**	**3**	**10**	**30**	**100**	**300**
Distribution-type	Poisson	100,00%	0	0	0	0	0	0
Average	**0**	0	0	0	0	0	0	0

12.12 Fire rail

Fatalities passengers								
Scenario	**0**	**1**	**3**	**10**	**30**	**100**	**300**	**Mean**
5.1.1	1,00E+00	0	0	0	0	0	0	0
5.1.2	1,00E+00	0	0	0	0	0	0	0
5.1.3	1,00E+00	0	0	0	0	0	0	0
5.1.4	1,00E+00	0	0	0	0	0	0	0
5.1.5	1,00E+00	0	0	0	0	0	0	0
5.1.6	1,00E+00	0	0	0	0	0	0	0
5.1.7	1,00E+00	0	0	0	0	0	0	0
5.1.8	1,00E+00	0	0	0	0	0	0	0
5.1.9	9,63E-01	3,59E-02	6,91E-04	8,28E-08	0	0	0	3,80E-02
5.1.10	9,63E-01	3,59E-02	6,91E-04	8,28E-08	0	0	0	3,80E-02
5.1.11	9,63E-01	3,59E-02	6,91E-04	8,28E-08	0	0	0	3,80E-02
5.1.12	9,63E-01	3,59E-02	6,91E-04	8,28E-08	0	0	0	3,80E-02
5.2.1	1,00E+00	0	0	0	0	0	0	0
5.2.2	1,00E+00	0	0	0	0	0	0	0
5.2.3	1,00E+00	0	0	0	0	0	0	0
5.3.1	1,00E+00	0	0	0	0	0	0	0
5.3.2	1,00E+00	0	0	0	0	0	0	0
5.3.3	1,00E+00	1,00E-04	5,00E-09	0	0	0	0	1,00E-04
5.3.4	1,00E+00	1,00E-04	5,00E-09	0	0	0	0	1,00E-04
5.4.1	1,00E+00	0	0	0	0	0	0	0
5.4.2	1,00E+00	0	0	0	0	0	0	0
5.4.3	1,00E+00	0	0	0	0	0	0	0
5.5.1	1,00E+00	0	0	0	0	0	0	0
5.5.2	1,00E+00	0	0	0	0	0	0	0
5.5.3	9,98E-01	1,99E-03	2,00E-06	0	0	0	0	2,00E-03
5.5.4	9,98E-01	1,99E-03	2,00E-06	0	0	0	0	2,00E-03
5.6.1	1,00E+00	0	0	0	0	0	0	0
5.6.2	1,00E+00	0	0	0	0	0	0	0
5.6.3	1,00E+00	0	0	0	0	0	0	0

Fatalities employees

Scenario	0	1	3	10	30	100	300	Mean
5.1.1	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.1.2	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.1.3	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.1.4	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.1.5	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.1.6	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.1.7	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.1.8	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.1.9	0,99923	0,00076	0,00001	0,00000	0,00000	0,00000	0,00000	8,00E-04
5.1.10	0,99923	0,00076	0,00001	0,00000	0,00000	0,00000	0,00000	8,00E-04
5.1.11	0,99923	0,00076	0,00001	0,00000	0,00000	0,00000	0,00000	8,00E-04
5.1.12	0,99923	0,00076	0,00001	0,00000	0,00000	0,00000	0,00000	8,00E-04
5.2.1	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.2.2	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.2.3	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.3.1	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.3.2	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.3.3	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	2,11E-06
5.3.4	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	2,11E-06
5.4.1	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.4.2	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.4.3	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.5.1	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.5.2	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.5.3	0,99996	0,00004	0,00000	0,00000	0,00000	0,00000	0,00000	4,21E-05
5.5.4	0,99996	0,00004	0,00000	0,00000	0,00000	0,00000	0,00000	4,21E-05
5.6.1	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.6.2	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0
5.6.3	1,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0,00000	0

Repair costs

	Repair costs [Euro] - fire inside enclosed tunnel							
Fire size	**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**	Mean
1	8,61E-01	1,39E-01	1,26E-09	0	0	0	0	2.250
2,5	7,33E-04	9,54E-01	4,52E-02	0	0	0	0	14.062
8	0	6,42E-04	9,50E-01	4,90E-02	0	0	0	144.000
15	0	1,01E-06	5,49E-01	4,51E-01	2,92E-07	0	0	506.250
20	0	0	1,12E-01	8,88E-01	1,26E-04	0	0	900.001
30	0	0	1,22E-04	8,86E-01	1,14E-01	0	0	2.024.998
50	0	0	0	7,56E-05	8,61E-01	1,39E-01	1,26E-09	22.499.986
200	0	0	0	0	1,12E-01	8,88E-01	1,26E-04	90.000.053
350	0	0	0	0	4,01E-04	9,36E-01	6,39E-02	157.500.132

	Repair costs [Euro] - fire on landsides							Mean
Fire size	**1,00E+03**	**1,00E+04**	**1,00E+05**	**1,00E+06**	**1,00E+07**	**1,00E+08**	**1,00E+09**	
1	1,00E+00	0	0	0	0	0	0	1.000
2,5	9,55E-01	4,51E-02	0	0	0	0	0	1.406
15	1,01E-06	5,49E-01	4,51E-01	2,92E-07	0	0	0	50.625
30	0	1,22E-04	8,86E-01	1,14E-01	0	0	0	202.500
200	0	0	0	1,12E-01	8,88E-01	1,26E-04	0	9.000.005
350	0	0	0	4,01E-04	9,36E-01	6,39E-02	0	15.750.013

Disruption

	Disruption [days] - fire inside enclosed tunnel - Incident tube							
Fire size	**0**	**1**	**7**	**14**	**30**	**180**	**365**	Mean
1	8,38E-01	1,39E-01	2,30E-02	0	0	0	0	0,3
2,5	7,71E-01	1,67E-01	6,18E-02	1,24E-07	0	0	0	0,6
8	7,27E-01	1,68E-01	1,05E-01	2,21E-06	0	0	0	0,9
15	6,60E-01	1,46E-01	1,93E-01	7,41E-05	0	0	0	1,5
20	3,13E-01	1,02E-02	5,01E-01	1,75E-01	9,65E-04	0	0	6,0
30	2,78E-01	2,09E-04	1,29E-01	5,12E-01	8,09E-02	1,62E-07	0	10,5
50	7,48E-01	0	0	1,66E-08	2,93E-03	2,50E-01	0	45,0
200	2,50E-01	0	0	0	0	7,50E-01	7,02E-05	135,0
350	2,50E-01	0	0	0	0	7,50E-01	7,02E-05	135,0

	Disruption [days] - fire inside enclosed tunnel - Non incident tube							
Fire size	**0**	**1**	**7**	**14**	**30**	**180**	**365**	Mean
1	9,63E-01	3,63E-02	7,67E-04	0	0	0	0	0,04
2,5	9,09E-01	8,58E-02	5,60E-03	0	0	0	0	0,13
8	8,55E-01	1,28E-01	1,74E-02	0	0	0	0	0,25
15	8,18E-01	1,50E-01	3,21E-02	4,06E-09	0	0	0	0,38
20	7,90E-01	1,62E-01	4,83E-02	3,33E-08	0	0	0	0,50
30	7,48E-01	1,69E-01	8,29E-02	6,12E-07	0	0	0	0,75
50	3,41E-01	1,82E-02	5,34E-01	1,06E-01	2,48E-04	0	0	5,25
200	2,78E-01	2,09E-04	1,29E-01	5,12E-01	8,09E-02	1,62E-07	0	10,50
350	2,78E-01	2,09E-04	1,29E-01	5,12E-01	8,09E-02	1,62E-07	0	10,50

	Disruption [days] - fire on landsides							
Fire size	**0**	**1**	**7**	**14**	**30**	**180**	**365**	Mean
1	8,38E-01	1,39E-01	2,30E-02	0	0	0	0	0,30
2,5	7,71E-01	1,67E-01	6,18E-02	1,24E-07	0	0	0	0,60
15	7,48E-01	1,69E-01	8,29E-02	6,12E-07	0	0	0	0,75

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