"How are hotspots identified at the railway, and how should the IM cope with the variable levels of risks?"

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Title:

«Unwanted occurrences at the Norwegian railway where third persons are hit by Train».

Excludes fatalities due to voltage and working accidents
Approx. $\frac{3}{4}$ of fatalities are suicides
- Third persons represent more than 90% of the remaining
Trend: 1-fatality-accidents constitute for a greater share of the total fatalities
Norway amongst the European countries with fewest fatalities at the railway
Historical overview: (Sources: SSB, NSB, JBV, ERAIL)

Fatalities at the norwegian railway, 1879-2017
Trend; increased no. of suicides

FATALITIES AT THE NORWEGIAN RAILWAY, 2007-2017
Are all attempted suicides registered?

No. of registered suicides and attempted at the Norwegian railway 1996-2015 (Source: JBV (IM))
Who collects data on suicides?

(DNV GL 2015; Assessment of the Impact of Rail Suicides on EU Railways: 

In Norway, the IM use the conclusions the police determinate regarding if the death is a suicide or not. The probability of suicide can be a lot more than 50% without being categorized as suicide.

RESTRAIL; Identification of hotspots: 
http://restrail.eu/toolbox/s pip.php?article80
Black-spot analysis; suicides (2007-2016)
Black-spot analysis; trespasses (fatalaties)
Large stretches without fatalities (2007-2016)

The picture is taken at Finse (1222 m. above sea level)

Photo: SNL; https://snl.no/Bergensbanen
Consentration around Oslo (Suicides)
Consentration around Oslo (Trespasses)
Suicides and trespasses seems to correlate with traffic and demographics

(Figure: JBV, 2016)
DISTRIBUTION OF DEATHS AT THE NORWEGIAN RAILWAY
2007-2016

- Station, inside station area, 26%
- Station, platform, 22%
- Open line, 33%
- LC, pedestrian, 14%
- LC, vehicle, 5%
Different distribution of suicides and other fatalities

SUICIDES
- LC, vehicle: 32, 34%
- LC, pedestrians: 1, 1%
- Stations, at platforms: 23, 24%
- Stations, inside station area: 27, 29%
- Open line: 11, 12%

Trespasses (deaths)
- 5, 18%
- 6, 21%
- 8, 29%
- 4, 14%
- 5, 18%
Conclusions from black-spot-analysis:

• Nearly 60% of the fatalities in the period 2007-2016 took place at stretches constituting less than 5% of the total railway length.
• Only suicides at the express line Oslo - Oslo Airport
• There were 7 stations with more than 1 fatality in the same period:

<table>
<thead>
<tr>
<th>Station:</th>
<th>Suicides</th>
<th>Accidental deaths</th>
<th>Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lillestrøm</td>
<td>5</td>
<td>0</td>
<td>Airport express train</td>
</tr>
<tr>
<td>Asker</td>
<td>4</td>
<td>0</td>
<td>2 in adjacent tunnels</td>
</tr>
<tr>
<td>Nationaltheatret (Oslo)</td>
<td>2</td>
<td>0</td>
<td>1 of 2 railway stations in Norway below surface</td>
</tr>
<tr>
<td>Kløfta</td>
<td>2</td>
<td>0</td>
<td>Trains passing at high speed</td>
</tr>
<tr>
<td>Blommenholm</td>
<td>2</td>
<td>0</td>
<td>Smaller station at lower-speed line</td>
</tr>
<tr>
<td>Vevelstad</td>
<td>2</td>
<td>0</td>
<td>Smaller station at lower-speed line</td>
</tr>
<tr>
<td>Brakerøya</td>
<td>0</td>
<td>2</td>
<td>Industrial surroundings, problem area</td>
</tr>
</tbody>
</table>
Risk analysis for suicides?

DNV report 2002-0130:
(Passing trains at speed above 130 km/h)
Risk for fatality at Lillestrøm station:
Once every 1000 year

Result 2007-2016:
5 suicides at station
How to avoid these incidents?

Selected measures from the RESTRAIL Toolbox:
(According to Haddon)

• FFCCTV
• Lighting
• Strive for good visibility
• Detection
• Direct help line
• Record and learn from incidents (database)
• **FENCES!! (Both at stations and outside them)**
Demand in Norway: chain-link fences (Source: Herasnorge.no)
Fencing in Norway

- Not mandatory along the railway
- Fences installed based on risk analysis + the ALARP-principle

Fences are due to:
- Wild animals
- Livestock
- Snow
- Real estate
- Persons
- Voltage
How to decide how to secure; what is a proper fence?
Fences can be way easier to pass in winter time in Norway.
Somewhere between Oslo and Oslo Airport
Snow clearance may induce risks elsewhere
Oslo, 2009

• 33-year-old man enter the railway at the site in the picture. Survives, with serious injuries.
• The Norwegian state pays 10 billion NOK in compensation

Photo:
VG, 26.02.19, private
PHOTO: VG, 25.02.19

• 15-year old pupil dies after passing the fence from the neighboring youth club to the left in the picture. The fence is only about 1 m of height.
• The fence is elevated after the fatality. The new fence is both higher (meets demand of 1,8 m) and more difficult to climb.
Fencing off objects

RESTRAIL:  
http://restrail.eu/toolbox/spip.php?article110

Source: ProRail / Photo © Erik van 't Woud
Enebekk LC
Landscaping
(Incl. designing and placement of term obstacles)

RESTRAIL;
http://restrail.eu/toolbox/spip.php?rubrique68

Brakerøya station
(2 accidental fatalities 2007-2016)

Screenshot; Bane NOR
(Målevognsbilde)
From the IMs technical legislation: No demands of sight length when the LC is secured.

Source: https://trv.banenor.no/w/images/a/a2/JD550_09_fig003.png
The car driver died, the LC was closed afterwards.

Sight? No demands of sight length when the LC is secured.

Source; report 08/2016, JBV (IM)