RESTRAIL

REduction of Suicides and Trespasses on RAILway property

Collaborative project

Evaluation of measures, recommendations and guidelines for further implementation

Pilot test #7

Societal collaboration to prevent railway suicide – TrV & KAU

Project Coordinator:
Jacques Colliard
International Union of Railways (UIC)
colliard@uic.org

RESTRAIL Consortium

	List of Beneficiaries		
No	**Beneficiary organisation name**	**Beneficiary short name**	**Country**
1	Union Internationale des chemins de fer	**UIC**	**FR**
2	Teknologian Tutkimuskeskus VTT	VTT	FI
3	Trafikverket - TRV	TrV	SE
4	Institut français des sciences et technologies des transports, de l'aménagement et des réseaux	IFSTTAR	FR
5	MTRS3 Solutions and Services LTD	MTR	IL
6	Fundación CIDAUT, Fundación para la investigación y Desarrollo en Transporte y Energia	CIDAUT	ES
7	Helmholtz Zentrum München Deutsches Forschungszentrum für Gesundheit und Umwelt (GmbH)	HMGU	DE
8	Karlstad University	KAU	SE
9	Fundación de los Ferrocarriles Españoles	FFE	ES
10	Turkish State Railway Administration	TCDD	TK
11	Deutsche Bahn AG	DB	DE
12	Instytut Kolejnictwa	IK	PL
13	ProRail B.V	PR	NL
14	Nice Systems Ltd	NICE	IL
15	Ansaldo STS	ASTS	IT
16	University of Nottingham	UNOTT	UK
17	INFRABEL	INFRABEL	BE

Table of contents

Acronym	Meaning
ADIF	ADministrador de Infraestructuras Ferroviarias
ERA	European Rail Agency
BTP	British Transport Police
CAEX	CAPital Expenditure
CBT	Computer Based Training
CCTV	Close-Circuit TeleVision
CN	Canadian National
DOW	Description Of Work
FFCCTV	Forward Facing Closed-Circuit TeleVision
GDL	German Drivers Leasing
HMTreasury	Her Majesty's Treasury
IM	Infrastructure Manager
IP	Important Point
IT	Information Technology
NPV	Net Present Value
OPEX	OPeration Expenditures
OTDR	On Train Data Recorder
PIER	Program in Interdisciplinary Education Research
2RProtect	Rail and Road Protect
RAILPOL	European Network of RAILway POLice Forces
RSSB	Rail Safety and Standards Board
RU	Railway Undertaking
SMIS	Safety Management Information System
SPSS	Statistical Package for the Social Sciences
STS	SysTemS
SWOV	Institute for Road Safety Research
TCRP	Transit Cooperative Research Programme
VAS	Visual Analogue Scale
VPC	Values of Preventing a Casualty
VT	Value of Time
CBA	Cost Benefit Analysis
CEA	Cost Effectiveness Analysis

1.1 Societal collaboration to prevent railway suicide – TrV & KAU

1.1.1 Overview of the piloted measure

This measure is collaboration among local authorities in the society to prevent railway suicide. When there is a threat of suicide a collaborated emergency plan is activated that involves both the infrastructure manager and other societal stakeholders. The involved parties go to the site where a threat of suicide have been reported and act to prevent a train-person collision.

The major part of the measure is that the train traffic is adapted to prevent a collision from happening when an unauthorized person is detected in the railway system. Another important part of the measure is that the involved stakeholders go to the identified site to perform the search and rescue. The temporary traffic shutdown or speed reduction ensures the safety of the person at risk, but also the safety for the police, rescue services and ambulance, the parties responsible for conducting search and rescue. See more in chapter 5.7.1 in Deliverable 5.1 (Kallberg, Plaza, Silla, García et al, 2014)

1.1.2 Methodology to evaluate the piloted measures

In the evaluation of the measure, the following methods were used:

- Qualitative interviews with stakeholders

Eight interviews have been conducted with participants in the collaboration about their experiences of working together. Among those, there are representatives from the police, the fire brigade and the National Transport Administration. Each interview was semi-structured and based on a list of themes that was accounted for in all the interviews. Sometimes the respondents' answers lead to new questions to follow up. The questions could also vary depending on the information given. The interviews were then transcribed and analysed based on a method of content analysis. The interviews were coded in meaning units, categorised and condensed into main themes (Hsieh and Shannon, 2005).

- Quantitative analysis of relevant events in the targeted rail network from June 1st to December 31st, 2013.

All registered events in the Transport Administration database were analysed together with rail-related incidents from the police database. A total of 185 events that occurred during the seven month period June 1 to December 31, 2013, have been studied. The data report shows on when - where - how these events have occurred and the delays that these events have caused.

1.1.3 Reported costs for measure

Reported costs for the measure implemented are given **Table 1.1-1.**

Table 1.1-1: Societal collaboration to prevent railway suicide

Cost	Nature	value
Travel costs for meetings 2 times a year (estimated travel cost per meeting/person: 30 EUR)	8 persons x 2 meetings x 30 €	480 €
Personell costs á 3 hours each meeting (estimated cost per hour/person 80 EUR)	8 persons x 2 meetings x 3 hours x 80 €	3 840 €
Total		4 320 €

1.1.4 Evaluation results

The outcome of the qualitative interview study shows three main themes that can summarize the experience of the involved participant in the societal collaboration in Skåne. These themes are: thoughts about the value of the collaboration, the importance of communication and experiences of working with traffic stops.

Thoughts about the value of the collaboration

The ”Blue-light-” collaboration started out as a project, initiated by the police, and was later decided as the common way of working together. Initially there were some doubts from the persons working about this new task, but eventually, gaining experiences and knowledge with this project, is now considered to be an ordinary part of the daily work. As one of participants, from the rescue services, writes: “the task to act whenever there is a threat for suicide in the railway is now our work.

The purpose of this collaboration is to save lives by stopping the trains and remove the person who has threatened to take their life and this initiative has huge benefits. It is short traffic stops instead of the long stops (approximately 2 hours) that a person-train accident would cause.

There is a lot to gain from reducing the number of suicides in the railway system since a suicide does not only affect the relatives and friends, but it also causes delays, that in their turn cause problems for both the infrastructure manager, the train companies and the passengers. According to the rescue services/fire brigade suicide and trespass accidents in the railway system is one of the more demanding and tough tasks they face.

Importance of communication

When there is an alert that someone unauthorized is in the track, it usually comes through the Police or the emergency call centre. The Emergency call centre makes contact with the transport administration, to ask for the trains to be stopped (if there is knowledge of exactly where the person is) or a speed reduction (if there is uncertainty of the exact spot) if an area needs to be searched. The emergency call centre alerts the other participants. But there are also alerts from train drivers if they see someone in the wrong place. In those events, the Train Control centre alerts the emergency call centre, and they make contact to police, rescue service and ambulance.

It is important that direct contact is established between the Traffic Management/traffic control centres emergency telephone and the officer in command at the search site (police or emergency services, depending on who is first to arrive) so that no communication goes through any other channels of communication, for example, the police call centre. This can be complicated since those involved in the rescue use the Rakel-phone (radio system, Swedish version of the TETRA-system), and this is not necessarily the phone used by the train control centre, at least not the phone used by one responsible for stopping the traffic and restarting it again. The Transport Administration want all incoming alerts to go through a designated phone at the train control centre, this since it is listened to by others that also might get involved (for example if the traction current electricity needs to be shut off).

A Rakel-phone is a joint phone system among the “blue-light” authorities and now it is also used by parts the Train Control centre in the region. The advantage with Rakel is that everyone gets the same information which is a huge benefit when there is an acute situation. But, there can be problems in the train control centre, since the person using the Rakel-phone is not the same as the person handling the traffic. This might give a sense of false safety for the others that believe that the person running the traffic and stopping the train can hear what they are saying. This is a potential for improvement. To maintain a good quality and avoid long traffic stop the Transport Administration should expand the cooperation and improve communication so they can support the other participants. This would in turn support the rescue services that work in track environment to save lives. They give the opportunity to get the traffic back to normal again as soon as possible.

The other stakeholders have expressed that there is confusion about who to communicate with at the Transport Administration. Often it may be several different persons involved in a situation/conversation. The traffic management and operational management within the transport administration is different people.

For the safety of everyone, the communication needs to be optimized and it is essential that everyone uses a “language” that is understood by everyone. There have been problems since the railway use kilometre of the track and the other participants’ use a GPS coordinate and/or refer to the road system.

Experiences of working with traffic stops

The Collaboration is now a reality; it has turned from being a project into a phase where it is managed on daily bases. Everyone involved recognize that the collaboration is important and can see advantages in that the rescue services can support the police, and many times even act faster than the police and remove the suicidal person themselves. There is a constant evaluation going in this work, where the participants meet and go through the deviations that have happened.

It is and important issue that anyone can ask for the traffic stop but only those present on the scene can evoke. The emergency call centre can never evoke the traffic stop. Different authorities have their own chain of command and the rescue services always call on an officer in command to go to the scene to facilitate decision making between the participants.

When the mission is finished, everyone gets together to make sure that no one is still working in the track area. Only when everyone is accounted for the traffic stop can be called off.

It is also important that the police or rescue service not make demands for more than a traffic stop. There is no need to shut down the power in the overhead lines to perform search and rescue. Shutting down the power means that a very large part of the railway system is down and that many trains are left on the track without working toilets or air-condition/heating. A traffic stop is sufficient enough.

The train operators want the search and rescue to work more with speed reductions than traffic stops. This is also a view that the train control centre is known to support. If there is a specific place that is known, a traffic stop is arranged, but if not, for the sake of traffic, it gives a huge difference if a temporary speed reduction is put in place. A speed reduction can always be changed for a traffic stop at a later time, and a traffic stop can also be changed into a temporary speed reduction.

Quantitative results

To gain more knowledge on the situation in Skåne concerning trespass and suicide threats, data have been compiled during a seven month period. The quantitative part of this report has analyzed these data to describe the situation during this period.

The numbers of events that have been reviewed are 185 cases in the period of 2013-06-01 to 2013-12-31. There have been 111 cases of traffic stops, and 28 with a temporary speed reduction. 64 threats of suicide and 40 persons have been taken into custody by the police (and referred to psychiatric care).In this study only “threat of suicide” has been examined since this is a project to prevent suicides. A breakdown of incidents and threats of suicide occurred in Skåne, (Malmö maintenance area and Hässleholms maintenance area). There are some comments regarding the different variables under each table.

Threat of suicide (total= 64)

When these events occur:

- *By Month*

During the summer months there are few cases and during Sept–Dec, there is a fairly even distribution (11–14 threat of suicide) as it is collected in **Table 1.1-2**.

Table 1.1-2: Number of suicide threats by month

Month	Nº of incidents
June	3
July	9
August	1
September	13
October	14
November	11
December	13
Total	**64**

- *By weekday*

Most incidents registered occur on Tuesday and Saturday (14 cases) and least Thursday (4 cases) (**Table 1.1-3**).

Table 1.1-3: Number of suicide threats by weekday

Weekday	Nº of incidents
Sunday	5
Monday	8
Tuesday	14
Wednesday	11
Thursday	4
Friday	8
Saturday	14
Total	**64**

- *Time of day*

Even between 12 and 24, and from midnight until 12 (**Table 1.1-4**).

Table 1.1-4: Number of suicide threats by time of day

Time of day	Nº of incidents
06-09	3
12-15	12
15-18	13
18-21	11
21-24	12
24-03	4
03-06	3
09-12	6
Total n:o	**64**

- *Where these events occur*

- Access point: Most incidents are on the platform or in the station area close to the platform (**Table 1.1-5**).

Table 1.1-5: Number of suicide threats by access point

Access point	Nº of incidents
Platform	13
Outside of platform	22
On the railway line	6
Shunting yard	1
Un known	16
Bridge/Tunnel	6
Total	**64**

- *Actions:*

In the text it is often mentioned that someone is threatening to "jump" in front of trains. If it has been so, is hard to tell. It is likely that people have been next to or on the railway line in one way or another (**Table 1.1-6**).

Table 1.1-6: Number of suicide threats by action

Action	Nº of incidents
Sitting/lying	5
Threatening to jump	28
Stand/walk	10
Trespass	6
Unknown	15
Total	**64**

- *Consequences*

Traffic stops: of the 64 cases, 49 traffic stops were conducted (**Table 1.1-7**).

Table 1.1-7: Number of suicide treats by type of traffic stop

Traffic stops	Nº of incidents
Traffic stop	49
Speed reduction	11
No action	1
Unknown	3
Total	**64**

- *Taken into custody*

40 of 64 have been taken into custody either by police or a security guard (**Table 1.1-8**).

Table 1.1-8: Number of suicide treats by taken into custody

Taken into custody	Nº of incidents
Yes	40
No	13
Unknown	11
Total	**64**

- *Delays:*

In 48 incidents (of a total of 64) delays have been less than 30 minutes (**Table 1.1-9**).

Table 1.1-9: Number of suicide treats by length of delay

Delay	Nº of incidents
< 10 min	19
< 20 min	19
< 30 min	10
< 40 min	2
< 50 min	2
< 60 min	4
> 60 min	1
No data	7
Total	**64**

Quantitative analyse

The pattern that emerges upon examination of the data shows that fewer events occurred during the summer months and more in the fall. Likewise, there were fewer threats of suicide on weekends and most took place during midweek. During the day and night most of the incidents occur in the afternoon and evenings. Comparisons if it was dark or light at the place were not possible to do. It is difficult to discern any specific patterns, more than that people seem to act at the same time when many others are on their way in the railway system (commuter times). If it is because the person want to blend in, or if he/she have knowledge that it is frequent train services, are difficult to determine. Many reach the tracks from the platform or act within the borders of a society, which reinforces the pattern that the suicidal person mostly doesn't have to go long distances to find a railway (Rådbo, 2012). Estimation of distances between the suicidal person's home address and chosen location on the railway has not been made.

When a threat of suicide takes place the consequences is that the person is taken into custody and the train traffic is affected by the traffic stop or reduced speed with delays as a result. Through community action and reaction that someone is in the wrong place, 40 of the 64 person threatening to commit suicide on the railway has been seized by police and taken to medical/psychiatric care. The activity and the response of society to save the person has in turn led to disruption in the rail traffic and it is average that traffic is influenced or stationary for about 30 minutes for each event. Most traffic stops have, however, lasted less than 30 minutes, (48 of 64 threats of suicide).

In 30 cases where a person have been taken into custody by the police (total no: 40 persons) the event have occurred on a stretch of about 25 kilometres. This section consists of the busiest train lines that run through the southern part of Sweden. Disturbances in this part of the network can provide great impact on other parts of the Swedish rail network as well.

Example calculation based on assumed number of lives saved

Assumption nr 1: If a train is stopped for 120 minutes in average when a fatal accident occurred, a disruption on the train traffic in a larger area can be estimated to be up to 4 times,120 minutes before it goes back to normal again. 4 *120=480 minutes (8 hours).

Assumption nr 2: A conservative assumption is made that 10% of those who threatened to take their life is saved and not is involved in a collision (**Table 1.1-10**).

From these two estimations we can see that if 4 people have been rescued, 30 hours of disruption have been avoided (40 * 0:10 * 8 = 32). (The time saved for the 4 persons that were saved can be deducted from the 32 hours with an average of 30 min delays for each).

The conclusion of this calculation if the assumption that 4 people have been rescued, shows that all the short traffic stops (25 hours for 64 threats of suicide) save time compared to the 4 longer traffic stops (30 hours) the four saved would have caused if they not been saved.

Thus, the total of delays of short traffic stops recorded for 64 threats of suicide is shorter than if 4 of these have been hit by the train.

If we also count a life saved, that is valued by the Swedish Transport Administration, just over 31 million SEK (3 MEuros), this action to save four lives amounts to 31 * 4 = 124 million SEK saved to society (Trafikverket, 2012).

Table 1.1-10: Admitted numbers into numerical example regarding traffic stop on the railway

Some facts and estimates for the calculated example how much short traffic stops affect the traffic compared to a occured train-person collision	
25 hours	The total time of traffic stops that is recorded for 64 threats of suicide (including an estimation of 30 min delay per case of 7 unknown cases).
40 cases	Number of suicide threats in the Skåne area that the police has taken to psychiatric care.
0, 10 = 10 %	Estimated number that have been rescued by the collaboration work, 40*0,10 = 4 persons
120 min (2 hours)	Average time the train is stopped because due to suicide/fatal accident (train-person collision) on the railway
480 min (8 hours)	The estimated time that 4 collisions * 2 hours disrupted and affecting the train traffic in a larger area before it goes back to normal schedule again.
40 hours	The delay due to the five fatal accidents that occurred in the area during the investigated period

CBA for the societal collaboration to prevent railway suicide

For this measure, cost is mostly related to coordination and awareness between actors. Effectiveness can be estimated from the number of suicide accidents prevented, which can be extrapolated from the recorded number of persons saved due to the measure for a period of seven months. In addition to computing the corresponding CEA, an indicative CBA is also proposed, using the effectiveness value multiplied with a Value of Statistical Life of 3000000€. Results and assumptions are provided in the **Table 1.1-11.**

Table 1.1-11: CEA of "Societal collaboration to prevent railway suicide"

Cost [C]	**4320 €**
Effectiveness measures **Estimated number of suicide prevented per year**	6,86 (4 persons saved / 7 months * 12)
Assumption(s)	The reduction is considered as constant and representative of the cumulated effect whatever the months in the year Saved persons are taken in charge by healthcare services and won't make any new attempts.
CEA [E/C]	0,001587302
CBA (same formula as CEA with E monetized)	4763,888889

Bearing in mind the limits of the current calculation, the CEA results can be interpreted as follows: an investment of 1 euro will save 0,0016 lives, or put in another ways: with this

measure, an investment of 630 Euros corresponds to one saved life). The CBA ratio can be interpreted as the fact that an investment of 1 euro will yield 4764 euros.

It is worth to note that a complete CBA should take a real account of all impacts, including delays due to the measure as well as any other impacts on staff, drivers etc. To go a step further, it would be also required to be able to distinguish between traffic interruptions and delays generated from these interruptions due to an intervention and those due to accidents or incidents that were not detected. A more extensive discussion on these impacts and potential benefits can be found in the section dedicated to providing results for this measure.

1.1.5 Applicability of results to different circumstances

The collaboration between the authorities needs to be seen from different contexts in different countries. The society and public resources is used in different ways. But since suicide is a public health problem there is a need not only for the work of the authorities respectively, but also for their joint collaboration. In an emergency situation, when someone is threatening to take their life, the society has a very limited time to act. If the authorities join forces, a result can be achieved that would not have been possible otherwise. The achieved result is a great success for society. During this study we have learned that a very clear communication between the participants is of great importance. Not only because of safety reasons, but also to better achieve success and create opportunities to save lives.

1.1.6 Discussion

The purpose of the measure is to create good circumstances for a proactive societal collaboration when there is a threat of suicide in the railway system, and by this reduce the number of fatalities and injured persons due to suicide attempts.

Societal collaboration as a measure of suicide prevention is an activity that all the involved parties believe makes a difference, and are certain that lives have been saved. The partnership in the collaboration has created good circumstances to act if there is a person who threatens to take his or her life. By interviewing and examining data concerning past events, the result show that this action can be considered as an effective measure to prevent suicide on railways.

According to the quantitative analysis, 40 of the 64 persons threatening to commit suicide has been found and taken (into custody) by the police. Very few suicide prevention measures are as close to potential suicidal persons and have the opportunity to influence the outcome the same way as does this societal collaboration.

Skåne and the areas where most trespasses are reported is a relatively densely populated area with some major cities with a large population. Thirty or forty threats of suicide have occurred on a stretch of about 25 kilometres. This section consists of the busiest train lines that run through the southern part of Sweden. Disturbances in this part of the network can provide considerable impact on other parts of the network as well.

Consequently, societal collaboration is a method of suicide prevention that saves lives and all the involved parties believe that their work makes a difference

Good communication is essential when different stakeholders work together in a dangerous environment (railway area).

40 of 64 suicidal persons has been found and taken to psychiatric care by the police.

A first try of assumption and calculation show that the train service is less disturbed by short traffic stop on more occasions than of an actual fatal accident.

Based on the pattern of how and where suicidal persons are acting it is clear that the problems are largest within towns.

For this area most events occur on a relatively small part of the railway system.

Along with increased fencing and developed camera surveillance this societal cooperation is an effective measure to prevent suicide. The huge strength in the measure is that instead of expecting the suicidal person to reconsider and turn away from the railway property and the suicide intent, there are fellow human beings that react and try to stop a suicidal person to act out (Rådbo 2012).

1.2 References

Beskow, J., Palm Beskow, A., and Ehnvall, A. (2005) Suicidalitetens språk. Lund. Studentlitteratur.

Beskow, J., Thorson, J., Öström, M. (1994). National suicide prevention programme and railway suicide. Soc Sci Med. Vol 38, No 3. 447–451.

Bickel, P., Friederich, R., Burgess, A et al.(2006). *"Proposal for Harmonised Guidelines"*, Deliverable 5, HEATCO *"Developing Harmonised European Approaches for Transport Costing and Project Assessment"*, 2nd Revision, February 2006. Available at: http://heatco.ier.uni-stuttgart.de/HEATCO_D5.pdf

Burkhardt, J.-M, Radbo H., Silla, A. and Paran F. (2014). A model of suicide and trespassing processes to support the analysis and decision related to preventive railway suicides and trespassing accidents. *Transport Research Arena*, 14-17 Apr 2014 Paris La Défense (France).

Burkhardt, J-M; Beurskens, E.; Ryan, B.; Hedqvist, M. et al (2013). RESTRAIL (Reduction of Suicides and Trespasses on RAILway property) project. Assessment of suitable measures (Technical and soft measures) for the prevention of suicides and trespasses. Merged Deliverable D5.3. and D3.2. ; 28/02/2013.

CGSP (2013). L'évaluation socioéconomique des investissements publics (tome 1). Commissariat general à la stratégie et la prospective, septembre 2013.

Commonwealth of Australia (2006). *Introduction to Cost-Benefits analysis and other alternative evaluation methodologies.* Dpt of finance and administration, January 2006. Available at: http://www.ag.gov.au/cca

Cross, W., Matthieu, M.M., Lezine, D., and Knox, K.L. (2010) Does a brief suicide prevention gatekeeper training program enhance observed skills? *Crisis, 31*(3):149-159.

Elvik, R., Høye, A., Vaa, T. & Sørensen, M. 2009. *The Handbook of Road Safety Measures*. Second Edition. Emerald.

Erazo N, Baumert J, Ladwig KH (2005). Factors associated with failed and completed railway suicides. *J Affect Disord 88, 137-43.*

Erazo NS, Baumert J, Ladwig KH (2004). Sex specific time patterns of suicidal acts on the German railway system. An analysis of 4003 cases. *J Affect Disord 83: 1-9).*

European Railway Agency (2013). *Implementation guidance for CSIs*, Annex I of directive 2004/49/EC as amended by directive 2009/149/EC. Report ERA/GUI/09-2013 v 2.3.

Florio, M. et al. (2008) "Guide to cost-benefit analysis of investment projects: structural funds and instrument for pre-accession." (2008). *EUROPEAN COMMISSION Directorate General Regional Policy*. Available at: http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide2008_en.pdf

Hauer, E. (1997). *Observational Before-After Studies in Road Safety*. Pergamon.

Hills, D, Junge, K. (2010) *Guidance for transport impact evaluations*. The Tavistock Institute, London. Available from http://www.roadsafetyevaluation.com/evaluationguides/index.html.

Hills, D. (2010) *Logic mapping: hints and tips guide*, Department for Transport, UK.

HM Treasury (2011). *The Magenta Book. Guidance for evaluation.* HM Treasury. Downloaded from http://www.hm-treasury.gov.uk/data_magentabook_index.htm, 1 February 2013.

Hsieh, H–F., Shannon, S.E., 2005. Three Approaches to Quantitative Analysis. *Qualitative health research 15* No 9, 1277–1288.

Hsieh, H–F., Shannon, S.E., 2005. Three Approaches to Quantitative Analysis. Qualitative health research 15 No 9, 1277–1288.

Kallberg, Plaza, Silla, García et al (2014). RESTRAIL (Reduction of Suicides and Trespasses on RAILway property) project. D5.1. Selection of measures and their implementation in pilot tests planning and execution, 31/07/2014

Karoline, L., Baumert, J., Erazo, N. And Ladwig, K-H (2014). Stable time patterns of railway suicides in Germany: comparative analysis of 7,187 cases across two observation periods (1995–1998; 2005–2008). *BMC Public Health* 2014, 14:124.

Lukaschek K, Baumert J, Ladwig KH (2011). Behavioural patterns preceding a railway suicide: Explorative study of German Federal Police officers' experiences. *BMC Public Health* 11: 620; Gaylord MS, Lester D: Suicide in the Hong Kong subway. Soc Sci Med1994, 38:427-430.

Mann, JJ; Apter, A; Bertolote, J; Beautrais A, Currier D, Haas A, et al (2005): Suicide prevention strategies: a systematic review. JAMA, 294:2064-2074

Meunier, V (2009). Analyse coût-bénéfices : guide méthodologique. Cahiers de la Sécurité Industrielle, 2009-06: Institute for an Industrial Safety Culture, Toulouse, France (ISSN 2100-3874) at http://www.icsi-eu.org/français/dev_cs/cahiers/.

O'Donnell I, Farmer R, Tranah T (1994): Suicide on railways. *Soc Sci Med*, 39:399-400

Rådbo, H., Renck, B., & Andersson, R. (2012). Feasibility of railway suicide prevention strategies; a focus group study. In C. Bérenguer, A. Grall & C. Soares (Eds.), Advances in safety, reliability and risk management. London: Taylor & Francis Group.

Rådbo, H., Renck, B., & Andersson, R. (2012). Feasibility of railway suicide prevention strategies; a focus group study. In C. Bérenguer, A. Grall & C. Soares (Eds.), Advances in safety, reliability and risk management. London: Taylor & Francis Group.

Randles, R.H. and Wolfe, D.A. Introduction to the theory of nonparametric statistics, John Wiley & Sons, New York etc (1979).

RESTRAIL. 2014. Deliverable 5.1. Selection of measures and their implementation in pilot test planning and execution.

Silla A. and Luoma, J. (2012). Opinions on railway trespassing of people living close to a railway line. Safety Science 50, 62–67.

Silla, A. (2012). Improving safety on Finnish railways by prevention of trespassing. Espoo 2012. VTT Science 27. 49 p. + app. 43 p.

Trafikverket (2012). http://www.trafikverket.se/PageFiles/73641/samhallsekonomiska_principer_och_kalkylvarden_for_transportsektorn_asek_5_kapitel_9_trafiksakerhet_2.pdf

Trafikverket (2012). http://www.trafikverket.se/PageFiles/73641/samhallsekonomiska_principer_och_kalkylvarden_for_transportsektorn_asek_5_kapitel_9_trafiksakerhet_2.pdf

Transport Note TRN- 6, 33927 (2005) “When and How to use NPV, IRR2 and modified IRR”, ,The World Bank, Washington D.C. 2005.

Van Houwelingen CA and Beersma DG (2001): Seasonal changes in 24-h patterns of suicide rates: a study on train suicides in The Netherlands. *J Affect Disord, 66:215-223.*

Wibble, T., Melin, G., Petersson, A., & Lagerqvist, J., (2005) Samverkan mellan polis, sjukvård, SOS Alarm och räddningstjänst vid hot om suicid. Karlstad Räddningsverket.

World road association, Technical committee C2, safer road operations (2012). *State of the practice for Cost-effectiveness analysis (CEA), cost-benefit analysis (CBA) and resource allocation*