RESTRAIL

REduction of Suicides and Trespasses on RAILway property

Collaborative project

D5.1. Selection of measures and their implementation in pilot tests planning and execution

Deliverable D5.1

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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

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1. EXECUTIVE SUMMARY

In this document are described the pilot tests that were conducted especially to improve the current knowledge about the impacts of selected measures against railway suicides and trespassing accidents, their occurrence or consequences. Furthermore, the pilot tests produced important information about the implementation process for those planning to implement similar measures. Therefore, the pilot tests focused on the monitoring of the implementation process and collection of data for the evaluation of the effects.

The RESTRAIL WP5 partners selected measures to be implemented independently from measures that were categorised as *recommended* or *promising* in earlier stages of the project, by taking into account the needs of the corresponding stakeholders. The piloted measures in different countries were:

- Warning signs and posters (Spain)
- Railway safety museum education programme for children, young people and families (Spain
- Education at schools for 8–11 year old children (Finland)
- Video enforcement and sound warning (Finland)
- A combination of measures at Aydin station (Turkey)
- Mid-platform fencing (United Kingdom)
- Societal collaboration to prevent railway suicide (Sweden)
- Gatekeeper programme (Germany)
- Gatekeeper programme (the Netherlands)
- Enhancement of cooperation of the police and legal entities through computer based training (Israel)
- Forward facing CCTV in trains (Great Britain)

Each pilot test was conducted in accordance to a specific implementation plan in order to monitor the evaluation process and to provide additional empirical evidence for the effectiveness of measures.

Four of the implemented measures targeted mainly suicides, five of the measures targeted trespassing accidents and two measures aimed to mitigate the consequences by speeding up the system recovery from such incidents. These measures were implemented in stations, other at stopping places, near hotspots, etc. And addition, the measures to be implemented were engineering -based (surveillance systems, physical barriers…) or not (education or prevention campaigns, trainings of personnel…).

This document collects only the descriptions of the specific plans in order to monitor the implementation of the different measures selected. All the information concerning the results of the evaluations as well as the recommendations and guidelines for the future set-up of these types of measures will be collected in D5.2. Evaluation of measures, recommendations and guidelines for the further implementation.

2. INTRODUCTION

According to the DOW of the RESTRAIL project, the WP5 objectives are the following:

- To select the most promising preventative and mitigation measures to be implemented in the pilot tests (task 5.1), derived from previous work packages;
- to implement several pilot tests in different locations in Europe (Task 5.2);
- to analyse the results of the trials (Task 5.3); and
- to provide some recommendations and guidelines about the most appropriate measures and their implementation to railway stakeholders, in order to prevent suicides and trespassing in the railway property.

2.1 Purpose and structure of the document

The document *D5.1 Selection of measures and their implementation in pilot tests planning and execution* compiles the final group of selected measures (coming from WP2, WP3 and WP4) implemented as pilot tests, as well as one specific plan associated to each measure in order to monitor the implementation, including the execution of these tests.

This document, in the first place, collects several studies about the effectiveness of several preventing measures which have already evaluated as well as the main conclusion about the current situation of the effectiveness of this kind of measures in railway property. As result of reviewing these studies, in the second place, a series of aspects have been considered to monitor and to evaluate the recommended measures. Afterwards, the contents of template used to know the specific plan of each partner in order to implement their measure is collected. And lastly, this document also includes how the preventing measures were implemented and all information concerning the implementation process, such as stakeholders involved, learnt lessons, costs of the installation, etc. and all information concerning the evaluation of measure and the collection of data.

2.1.1 Background

A literature review, carried out in WP1, consisted of around 170 scientific papers and reports concerning railway suicides or trespassing accidents, or closely related themes. This literature review highlighted the main differences and similarities between railway suicides and trespassing events and discussed the preventive measures which can be applied to prevent these both events. However, there is little published research available about the efficacy of different kinds of measures to prevent these incidents.

Therefore, it is most important that in future countermeasures will be implemented in a way that enables reliable estimation of their effects. Within WP5, a short review about the effectiveness of the preventing measures recommended from previous work packages was carried out. The amount of publicly available studies is limited as previous research has concentrated mainly on the analysis of reported incidents and accidents giving only a partial picture of the profile of trespassers. Many countermeasures have been proposed to deter trespassing, but there is little published research evaluating the efficacy of these interventions. Therefore, it is important to execute this type of studies.

One of the results of the literature review suggest that railway suicide and trespassing related behaviour tends to be specific to location and/or country and therefore, special attention should also be paid to the evaluation of the applicability of identified measures to different railway and cultural environments.

The studies with the objective to assess the effectiveness of measures which have been identified as recommended or promising in earlier phases of RESTRAIL project are presented in **Table 2.1-1**–**Table 2.1-3.** The following tables include only studies in which the measures have been implemented in railway/metro context[1]. The conducted analysis shows that there is a lack of scientific studies that have both implemented and evaluated measure(s) targeted to prevent railway suicides and/or trespassing accidents. Therefore, the pilot tests in WP5 will provide valuable contribution to this discussion.

[1] The evaluation studies investigating the effects of these measures in other environments other than in railway/metro context might also provide useful insights into the discussion of the effectiveness of the measures. However, they are not included in the tables.

Table 2.1-1: Organisational and procedural measures: The list of families of measures selected as recommended and promising in RESTRAIL, the corresponding specific measures and the existing evaluation studies.

Family	Corresponding specific measure(s)	Suicide	Trespass
		Reported evaluation results	Reported evaluation results
Risk assessment	Identification of hotspots		
	Monitoring of hotspot evolution		
	Planning for special circumstances		
	BTP PIER plans		
Learning from best practice	Learning from international experience		
	Learning from previous national experience		
	Learning from research studies		
Collaboration between organisations	Clarification of responsibilities		
	Communication strategy		
	Consultation with psychiatric hospitals		
	Collaboration with authorities		
	National suicide prevention strategy	Baumert et al. 2011	
	Innovative collaboration		
Societal collaboration to prevent railway suicides	Societal collaboration to prevent railway suicide		
Information sharing at regional level	Surveillance based on local intelligence		
Patrols and enforcement	Security patrols	Niederkrotenthaler et al. 2012	
	Security patrols able to fine		Lobb et al. 2003
Cooperation of the police and legal entities	Meetings of the IM/RU and the police and judicial entities		
	Memorandum of Understanding with the police and judicial entities		
	Agreed response plans and procedures		
	Police and judicial entity visits to rail facilities		
	Information for the police and judicial entities		

Table 2.1-2 Physical and technological measures: The list of families of measures selected as recommended and promising in RESTRAIL, the corresponding specific measures and the existing evaluation studies.

Family	Corresponding specific measure(s)	Suicide	Trespass
		Reported evaluation results	Reported evaluation results
Fences at stations	Intermediate fencing between tracks		
	Mid platform fencing		
	Fencing platform ends		Lobb et al. 2001
	Sliding doors at platforms	Law et al. 2009	Law & Yip 2011
	Anti-trespass grids		
	Symbolic deterrent fencing		
Fences outside stations	Fencing at hotspots		Silla & Luoma 2011
	Nets at bridges	Beautrais et al. 2009, Pirkis et al. 2013	
	Fencing off objects close to the tracks		
	Measure to soil clothes		
Landscaping	Removal of vegetation to increase visibility		
Detection and surveillance systems	Intelligent CCTV combined with sound warnings		DaSilva et al. 2006
	Detection systems combined with sound warnings		
Lighting devices to influence behaviour	Dispelling light source	Matsubayashi et al. 2012, Ichikawa et al. 2014	
	Lighting linked to a movement sensor		
	Tracking spotlight linked to a movement sensor		
Light to increase visibility at hotspots	Increased visibility by lighting at specific identified hotspots		
Safety and emergency devices at stations	Emergency information at stations to ensure rapid intervention		
	Information encouraging help seeking for people with suicide intent		
Incident management and information platform	Geo-data relating to the incident location and access points		
	Incident information, including third party involvement		
	Sharing OTDR information		
	Essential response actions		
Forward facing CCTV	Froward facing CCTV		

Table 2.1-3 Public awareness and educational measures: The list of families of measures selected as recommended and promising in RESTRAIL, the corresponding specific measures and the existing evaluation studies.

Family	Corresponding specific measure(s)	Suicide	Trespass
		Reported evaluation results	Reported evaluation results
Campaigns to raise awareness	Targeted campaigns to prevent suicide		
	Targeted campaigns to prevent trespassing		
	Targeted campaigns towards vulnerable categories		
Mass media campaigns	National campaign to prevent suicide		
	Campaign about safety		
Media guidelines	Media guidelines to avoid copycat behaviour	Hagert et al. 2013, Ladwig et al. 2012, Yang et al. 2013, Kunrath et al. 2011, Niederkrotenthaler & Sonneck 2007, Etzersdorfer & Sonnect 1998, Schmidtke & Häfner 1988	
	Publishing statistics		
	Announcements made to passengers after an incident		
	Removal of death memorials		
Posters and warning signs	Posters		Lobb et al. 2001
	Warning signs		
Prohibitive signs	Prohibitive signs		Silla & Luoma 2011
Education in and outside schools	Education at schools dedicated to risk and safety		Lobb et al. 2003, Lobb et al. 2001
	Integration of safety messages in school disciplines		
	Education for pupils outside of schools		
	Education for adults in locations close to tracks		
Training to prevent suicide	Gatekeeper training for front line staff	RSSB 2013	
Training to prevent trespass	Training to staff to identify different trespass		
Training and exercises to mitigate the consequences	Training for relevant IM & RU staff		
	Exercises for relevant IM & RU staff		
	Provide advice to staff on coping with traumatic events		
	Rail incident lessons in police training programmes		
	Conducting joint incident response and management exercises		

2.2 Definitions and acronyms

Term	Meaning
Accident	Involuntary collision between a train and/or persons on the tracks, resulting in injury or death.
Emergency	An unforeseen or unplanned situation that has implications for the safety of persons and for assets and requires immediate attention
First Responders	The fire, police or ambulance services where an incident occurs
Gatekeeper programmes	Gatekeeper programmes include a range of interventions focused on community or organizational gatekeepers (e.g. railway personnel, security personal, Samaritans) whose contact with potentially vulnerable populations provides an opportunity to identify at-risk individuals and to engage in preventive action. Education of gatekeeper programmes covers awareness of risk factors, policy changes to encourage help-seeking and availability of resources. In order to be effective, gatekeeper training must be a continuous, sustained effort with close monitoring and evaluation, ideally as part of a professional training curriculum.
Incident	Either trespassing accidents or suicides or both, depending on the context.
Infrastructure Manager	The organisation responsible for providing, maintaining and controlling the use of the infrastructure by railway undertakings.
Preventative measures	Known interventions or initiatives that are used in countries across Europe, which attempt to minimise incidents of suicide or trespass. These measures may take the form of different modes of operation, such as physical barriers to prevent or inhibit access to the track, or other interventions to influence the behaviours of people who might access track areas.
Railway Undertaking	An organisation, public or private, that manages the operations of public transport services concerned with the mass mobility of citizens. This includes their support facilities, such as rolling stock and maintenance facilities, and may involve international, national, suburban or urban networks. A railway undertaking may also be an infrastructure manager
Soft measure	Measures dedicated to influence actors' knowledge and behaviours by actions such as communication, training, calls for more socially-responsible behaviour aimed at preventing voluntary decisions to commit the acts, legal measures and sanctions following such acts.
Suicide	Act to deliberately injure oneself, resulting in death, as recorded and classified by the competent national authority.
Technical measure	Physical or technological artefact dedicated to the prevention of trespassing and/or suicides.
Trespassing accident	Accidents resulting in injuries to unauthorised persons on railway premises who are hit by a railway vehicle or by other object attached to or has become detached from the vehicle, including electrocution related to rolling stock in motion.

Acronym	Meaning
ADIF	ADministrador de Infraestructuras Ferroviarias
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 Close-Circuit TeleVision
GDL	German Drivers Leasing
HMTreasury	Her Majestry's Treasure
IM	Infrastructure Manager
IP	Important Point
IT	Information Technology
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 Standard Board
RUs	Response Units
SMIS	Safety Management Information System
SPSS	Statitical Package for the Social Sciences
STS	SysTemS
SWOV	Institute for Road Safety Research
TCRP	Transit Cooperative Research Programme
VAS	Visual Analogue Scale

3. SELECTION OF MEASURES FOR PILOT TESTS

The main objective of task 5.1 (Selection of measures and pilot test set up) was to make a final selection of the most promising measures to be implemented in the pilot tests. This chapter summarizes the results of the work carried out in this task.

A set of measures was proposed to RESTRAIL partners for wide implementation in railway environments throughout Europe, taking into account the existing national/regional differences. Based on this list, the partners selected those measures they would like to test in concrete contexts. The final list of implemented measures in RESTRAIL pilot tests is given at the end of this chapter.

The selected proposed measures resulted from the integration of the following subsets:

- final list of recommended and promising measures that resulted from the assessment conducted in WP2 and WP3 (Burkhardt et al., 2013)
- list of proposed new promising approaches that came from the in-depth analysis of soft measures against suicide in WP2 (Lukascheck et al., 2013) and trespassing in WP3 (Havarneanu et al., 2013a)
- list of mitigation measures that resulted from the work carried out in WP4 and collected during task 5.1.1 (Havarneanu et al. 2013b)

3.1 Preventative and mitigation measures assessed as recommended and promising

Table 3.1-1 presents the measures identified as recommended or promising during the work carried out in WP2 and WP3. This table lists all the general families of measures and the specific preventative measures included in each family.

The set comprises eight families of preventative measures against both suicide and trespass. In addition, nine families were dedicated to the prevention of railway suicides and four families of measures were dedicated to the prevention of trespassing. Some of these measures have been previously and successfully implemented in some countries, or in other cases, they emerged as promising new approaches during the work carried out in WP2 and WP3 or from the expert opinions collected in WP3. For example, measure 35 (Collaboration between organisations and agencies) was selected as promising only against suicide during the assessment process. However, following the results of Task 3.3 (Development of new approaches of soft measures; Lukascheck et al., 2013), the measure became promising against both suicide and trespass. Moreover, in some families, new specific measures were added as promising. It is worth to note that, as a consequence, the measures listed in this table are slightly different from the ones reported in the previous RESTRAIL deliverables.

Table 3.1-1: Recommended and promising measures (families of measures and corresponding specific measures) to prevent railway suicides and trespassing accidents (Burkhardt et al., 2013; Lukascheck et al., 2013; Havarneanu et al., 2013).

ID	Families of measures	Corresponding specific measure(s)	Classification for suicide	Classification for trespass
12	Campaigns to raise awareness	12.1 Targeted campaigns to prevent trespassing 12.2 Targeted campaigns to prevent suicide 12.3 Targeted campaigns towards vulnerable categories	**Recommended**	**Promising**
25	Fences at stations	25.1 Intermediate fencing between platforms 25.2 Mid platform fencing 25.3 Fencing platform ends 25.4 Sliding doors at platforms 25.5 Anti-trespass grids 25.6 Symbolic deterrent fencing	**Recommended**	**Recommended**
26	Fences outside stations	26.1 Fencing at hotspots 26.2 Nets at bridges 26.3 Fencing off objects close to the tracks 26.4 Measures to soil clothes	**Recommended**	**Recommended**
8	Patrols and enforcement	8.1 Security patrols 8.2 Security patrols able to fine	Promising	Promising
14	Mass media campaigns	14.1 National campaigns to prevent suicide 14.2 Campaign about safety	Promising	Promising
36	Risk assessment	36.1 (British Transport) Police Pier plans 36.2 Identification of hotspots 36.3 Planning for special circumstances 36.4. Monitoring of hotspot evolution	Promising	Promising
37	Learning from best practice	37.1 Learning from international experience 37.2 Learning from previous national experience 37.3 Learning from research studies	Promising	Promising
35	Collaboration between organisations	35.1 Clarification of responsibilities 35.2 Communication strategy 35.3 Consultation with psychiatric hospitals 35.4 Collaboration with authorities 35.5 National Suicide Prevention Strategy 35.6 Innovative collaboration	Promising	Promising new approach
6	Lighting devices to influence behaviour	6.1 Dispelling light source 6.2 Lighting linked to a movement sensor 6.3 Tracking spotlight linked to a movement sensor	Recommended	
7	Detection and surveillance systems	7.1 Intelligent CCTV combined with sound warnings 7.2 Detection systems combined with sound warnings	Recommended	
2	Light to increase visibility at hot spots	2.1 Increased visibility by lighting at specific identified hot spots	Promising	

4	Landscaping	4.1 Removal of vegetation to increase visibility	Promising	
11	Information sharing at regional level	11.1 Surveillance based on local intelligence	Promising	
15	Media guidelines	15.1 Media guidelines to avoid a copycat effect 15.2 Publishing statistics 15.3 Announcements made to passengers after an incident 15.4 Removal of death memorials	Promising	
29	Safety and emergency information at stations	29.1 Emergency information at stations to ensure rapid intervention 29.2Information encouraging help seeking for people with suicide intent	Promising	
38	Societal collaboration to prevent railway suicides	38.1 Societal collaboration to prevent railway suicide	Promising	
19	Training to prevent suicide	19.1 Gatekeeper training for frontline staff	Promising new approach	
13	Education in and outside schools	13.1 Education at school dedicated to risk and safety 13.2 Integration of safety messages in school disciplines 13.3 Education of pupils outside of schools 13.4 Education for adults in locations close to schools		Recommended
31	Posters and warning signs	31.1 Posters 31.2 Warning signs		Recommended
30	Prohibitive signs	30.1 Prohibitive signs		Promising
20	Training to prevent trespass	20.1 Training of staff to identify different trespassers		Promising new approach

Table 3.1-2 presents the measures which were identified as recommended or promising to mitigate the consequences of railway suicides and trespassing accidents. The recommended and promising mitigation measures are different from the preventative measures that were presented in the previous table.

Table 3.1-2: Recommended and promising mitigation measures.

ID	Families of measures	Corresponding specific measure(s)	Classification for suicide & trespass
A	Cooperation of the police and legal entities	• Meetings of the IM/RU and the police and judicial entities • Memorandum of Understanding with the police and judicial entities • Agreed response plans and procedures • Police and judicial entity visits to rail facilities • Information for the police and judicial entities	Recommended
B	Training and exercises to mitigate the consequences	• Training for relevant IM & RU staff • Exercises for relevant IM &RU staff • Provide advice to staff on coping with traumatic events • Rail incident lessons in police training programmes • Conducting joint incident response and management exercises	Promising
C	Incident management and information platform	• Geo-data relating to the incident location and access points • Incident information, including third party involvement • Sharing OTDR (On Train Data Recorder) information • Essential response actions	Recommended
D	Forward facing CCTV (FFCCTV)	• Forward facing CCTV (FFCCTV)	Promising

3.2 Selection process and final list of pilot tests

In practice the measures for pilot tests were selected based on the preferences of the partners: All partners in work package 5 were asked which of the recommended or promising measures they could test. It was acknowledged that partners' possibilities to organise pilot tests depended on several factors, e.g. the type of measure, allocated resources, cost of the measure, time available for the completion of the test, and the interest and willingness of railway authorities and undertakings to cooperate in the implementation.

By February 2013 10 partners had suggested the following pilot tests:

- Warning signs and posters, Prohibitive signs (CIDAUT)
- Education and prevention in and outside schools (FFE)
- Education in schools, Video enforcement and sound warning (VTT)
- Mid-platform fencing, PIER plans for suicide prevention (UNott)
- A combination of measures at Aydinn station in Turkey (TCDD)
- Gatekeeper programme in Germany (HMGU)
- Local suicide prevention plan (KaU & TrV)
- Web-based tool for self-audit test (MTRS)

- Physical installation of incident management system (ANSALDO)
- Fences, new approaches to education for the community, Monitoring of hot spot (IFSTTAR)

The partners' suggestions for pilot tests were presented and discussed at the work package meeting in February 2013. It was decided at the meeting that the partners responsible for pilot tests should deliver implementation plans by April 10th 2013. By that date the following plans were received:

- Warning signs and posters-led by CIDAUT
- Video enforcement and sound warning- led by VTT
- Education at school- led by VTT
- Railway Safety Museum Educate Programme for Children, Young People and families- led by FFC
- Mid Platform fencing- Led by UNOT
- Gatekeeper programme "train the trainers"-led by HMGU.
- Societal collaboration ("local suicide prevention plan") by KaU and TrV
- Education and cooperation of the Police and legal entities- led by MTRS, PRoRail, DB and IK
- Self-audit checklist application-led by MTRS and VTT
- Incident management and information management and decision support platform-led by NICE and ANSALDO

Partners in work package 5 could then send their comments and their suggested amendments to the plans by April 30th 2013. In the next work package meeting in June 2013 it was concluded that the measures selected for pilot tests were (the responsible partner in brackets):

- Warning signs and posters (CIDAUT)
- Video enforcement and sound warning (VTT)
- Education at school (VTT)
- Railway safety museum education programme for children, young people and families (FFE)
- Mid-platform fencing (UNott)
- Gatekeeper programme (HMGU)
- Anti-trespass panels and fences (TCDD)
- Societal collaboration to prevent railway suicides (KaU & TrV)
- Training of police and legal entities in rail incident response arrangements (MTRS)
- Forward facing CCTV (MTRS)

These are the measures that were pilot-tested, although there were some modifications in the titles of the tests. Another pilot test – Gatekeeper programme in the Netherlands – was added to the list of pilot tests in December 2013, based on the suggestion of Prorail. Prorail has been subsequently nominated as responsible partner for that test.

4. PLANNING AND MONITORING OF PILOT TESTS

The aim of this chapter is to collect the specific plan developed for each pilot test in order to monitor the implementation of the different measures.

4.1 Preparations for pilot tests

Once preventative measures were selected for the implementation, the pilot tests preparation process started. All pilot test leaders were instructed in the following issues:

Expected results

The main objective of pilot tests is targeted at gaining information on the effect of the piloted measures on the number of railway suicides, suicide attempts and trespassing accidents. Or the effects on the railway system recovery time after such incidents. Furthermore, useful information concerning the implementation process was obtained from these trials. According to the preventative measure selected, different results are expected in the pilot tests set up:

- To reduce the number of suicide attempts and/or suicides by influencing the decision to commit suicide on rail tracks, or by influencing the perceived attractiveness and availability of railways.
- To reduce or eliminate the number of trespassing by influencing the decision to trespass, or by influencing the knowledge of regulations and awareness of risks.
- To reduce both trespassing and railway suicides by directing and supporting the correct behaviour (e.g. fencing, removal of existing unauthorised paths across tracks and installation of prohibitive signs) or by aiming to influence the access to tracks (e.g. fencing and landscaping) are expected to have a positive effect on both suicide and trespassing; though not with the same level of efficiency depending on the nature and mechanism underlying the specific measure.
- To reduce the consequences of the collisions by reducing the impact of the collision to the pedestrian or by reducing the shut down time.

In order to obtain this information, different implementation plans were developed as well as different evaluation plans were associated to each one of them, including plans for collection of data required for the evaluation.

Implementation within RESTRAIL schedule

Pilot test implementation should be completed within the schedule of RESTRAIL project. In other words, they should be completed no later than spring or early summer 2014 so that the evaluation results would be available for the final reports of the project (and the toolbox). All pilot test leaders had to bear in mind this schedule to be on time with the results and conclusions obtained. The **Figure 4.1-1** shows the implementation period of the selected measure.

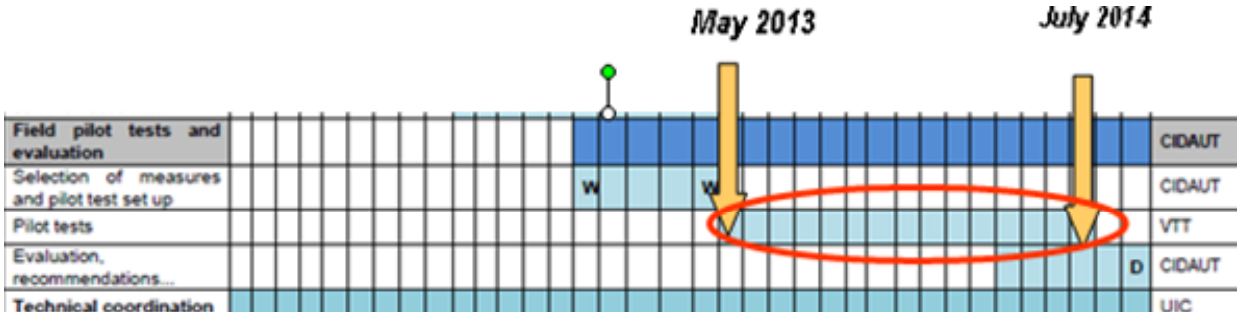

Figure 4.1-1: Implementation period of the selected measure in the RESTRAIL framework

Focus on the evaluation

In order to know the effectiveness of a specific treatment, WP5 pilot test leaders were informed to carry out an evaluation based on: (1) conducting a real experimental context and (2) performing a field evaluation in "before" and "after" conditions. In addition, the pilot tests should also provide information on the implementation process, e.g. what kind of problems were met and how they were solved, and give advice on issues that should be taken into account when planning implementation.

Nevertheless, in some cases, interventions/measures are not suitable for experimental or outcome based on evaluation designs. In this case, other approaches were also taken into consideration by WP5 partners, since the experimental work might not be sometimes feasible in this type of real world context.

As the experimental work is not feasible, theory based approaches provide a framework to understand, systematically test and refine the assumed connections (the theory) between an intervention/measure and the anticipated impacts (HM Treasury, 2011). They can also be used to test how effectively a measure has been implemented. They acknowledge the importance or relevance of different parts or aspects of an intervention/measure as well as the end-results. Furthermore, they also consider the impact of contextual factors on the implementation and effectiveness of interventions/measures. Two of the main theory based evaluation approaches were taken into account by WP5 partners for their pilot tests: the first one, the Theory of Change and the second one, the Realist evaluation approach.

Inclusion of control group when feasible

Pilot test leaders were also advised to be prepared to collect control data whenever possible, especially, in before-after studies, thus the effect of the measure could be separated from other simultaneously affecting factors.

Quantitative estimate on the reductions of accidents and fatalities, if possible

In the evaluation it was emphasised that the results should include quantitative estimates of the effects, preferably in terms of, for example, annual reductions in the numbers of railway suicides and trespassing fatalities/accidents. Even though it was recognised that it is hardly possible to give reliable estimates in small scale pilot tests, it would be desirable to try to give some estimates on the effect (on annual numbers of railway suicides and trespassing fatalities) if the measure would be implemented in large scale (e.g. covering all potential implementation targets).

For this purpose, the methodology has to include a series of appropriated indicators in order to assess the effectiveness of the measure or device implemented. Taking into account that the train-pedestrian collisions are relatively infrequent, some variables may be less meaningful in the railway field than in others, such as the number of railway accidents. This variable can be used to measure the effectiveness of traffic engineering treatments at locations where a sufficient number of railway accidents have been reported.

However, sometimes in order to have a sufficient number of accidents, several years of study are needed, doing the differences which could find in the accident frequencies, between the before and after periods, could not be associated only to the treatments implemented, but to other external factors too. Consequently, alternative measures are needed to evaluate the impact of railway treatments with the aim of avoiding the influence of unknown variables.

According to Korve et al. (1996), the number of movements by the users that usually present a threat of collision, could be a much better indicator of a location´s accident potential. For that reason, this variable is more frequent and consequently, more recommended as a better safety indicator than the number of accidents. Risky behaviours are easy to identify and are more numerous than accidents, providing more data for evaluating the effectiveness of treatments. Risky behaviour can be evaluated by field investigators' observations, but it is usually assessed through video recordings which is less obtrusive and counts on the replay of events.

4.2 Contents of implementation plans

The first request for the implementation of each preventative measure was to develop a preliminary implementation plan in order to know which measures WP5 partners had decided to implement and evaluate in their pilot tests and how they thought doing it. For this purpose, a template was defined and filled in by each WP5 partner. This form collected the most relevant information for the evaluation of the effects, especially on the effects of railway suicides and trespassing accidents and their consequences, costs and other issues. This preliminary implementation plan was required before starting to implement the preventative measures selected by WP5 partners. The plan was assessed and commented by WP5 task leaders whose approval was required before the measure was accepted for implementation. The implementation plan included the following issues:

- Title of the measure
- Brief description of the measure (e.g. what, where, how, target group)
- Implementation site (e.g. geographical location, type of environment, extent of implementation)
- Planned implementation period (e.g. month; consider also possible data collection in before period)
- Planned data collection period (before/after implementation)
- Effects to be evaluated (e.g. effects on effect on the number of suicides and/or trespassing accidents, impact on railway operations, impact on people and jobs, environmental impacts, acceptance, transferability, ethical issues etc.)
- Description of the effects mechanisms of the measures (for effects listed above) (how or why the measure is expected to have the desired effect?)
- Evaluation method(s) (e.g. before/after studies)
- Variables for which data will be collected (e.g. trespassing, intentions, attitudes, knowledge, number of targeted persons)

- How will the data on costs of the measure be collected
- If collaboration with other organisations is needed (e.g. with infra manager) has it been agreed?
- Are there ethical/practical issues related to the measure that need to be taken into account in implementation phase (e.g. effects on railway operations)?

4.3 Monitoring of pilot tests

The progress of pilot tests was monitored by progress reports which were delivered by all pilot test leaders to the responsible partner (VTT) at predefined intervals (a week or two before the work package meetings): in September and December 2013, and in February and April 2014. The last progress report (April 2014) was not required if the pilot test was completed before the deadline of the report; it was enough to submit the description of the pilot test for Deliverable 5.1.

Progress reports were delivered on a template. The subheadings of the template concerned:

- description of the measure
- implementation of the measure
- evaluation data, and
- lessons learned.

The most extensive effort by partners was done when writing the first progress report (September 2013). In the following rounds the writing of the progress reports concentrated on adding complementary information on eventual changes in the plans and schedule.

All progress reports were uploaded to the project extranet before each work package meeting and thus all partners had the possibility to read and comment the work related to other pilot tests. Progress reports were presented and discussed during the work package meetings. After the meetings the authors could adjust their work plan and future progress reports on the basis of the feedback given by other work package partners. VTT as responsible partner for pilot test implementation also provided direct feedback to pilot test leaders both after receiving the progress reports and during the work package meetings.

Even though the monitoring was meant to ensure that the implementation of pilot tests and collection of evaluation data progressed as planned, it was not unusual that some revisions to the plans had to be made. Usually the changes concerned delayed implementation; no major changes in the contents of pilot tests were reported. The reasons for revisions to implementation plans were e.g. related to unexpected changes in the environment (e.g. major roadworks affecting pedestrian behaviour at test site), delays in the responses to surveys or enquiries or delays related to responsible actors or organisations.

5. PILOT TESTS REPORTS

5.1 Pilot test 1: Warning signs and posters

Author: Juan Jose Plaza (CIDAUT)

5.1.1 Description of the measure

Overview

The place selected in order to implement the preventing measure selected is the stopping place named “Valladolid-Universidad” located at the conventional gauge railway, L Madrid-Irún, PK-25+600, in Valladolid, Spain (**Figure 5.1-1**).

Figure 5.1-1: Valladolid (Spain).

This stopping place has been identified as a hotspot with a high number of trespassing and real pedestrian-train fatalities. In addition, vandalism facts and graffiti actions have been detected at this stopping place.

In this rail area, there are a high number of users (pedestrians, cyclists, joggers and motorcyclists) who usually go across this stopping place to pass from the one area of the city to another side. Furthermore, there is also another group of users made up of the elderly, cyclists and joggers crossing this rail area to get a long green park where they can carry out their recreation activities such as walking, riding bike and jogging.

Figure 5.1-2 shows the different part of the infrastructure of this stopping place. Thus, this rail property is made up of one entrance from both sides of the tracks, one underpass, one cross-platform interchange, and fence in both sides that impedes the access to the platforms. There is an additional zone to platforms with lamps and benches in both side targeted at resting and waiting for the train. Concerning the cross-platform interchange, its function is to let passengers go cross from one platform to another, but rail passengers only.

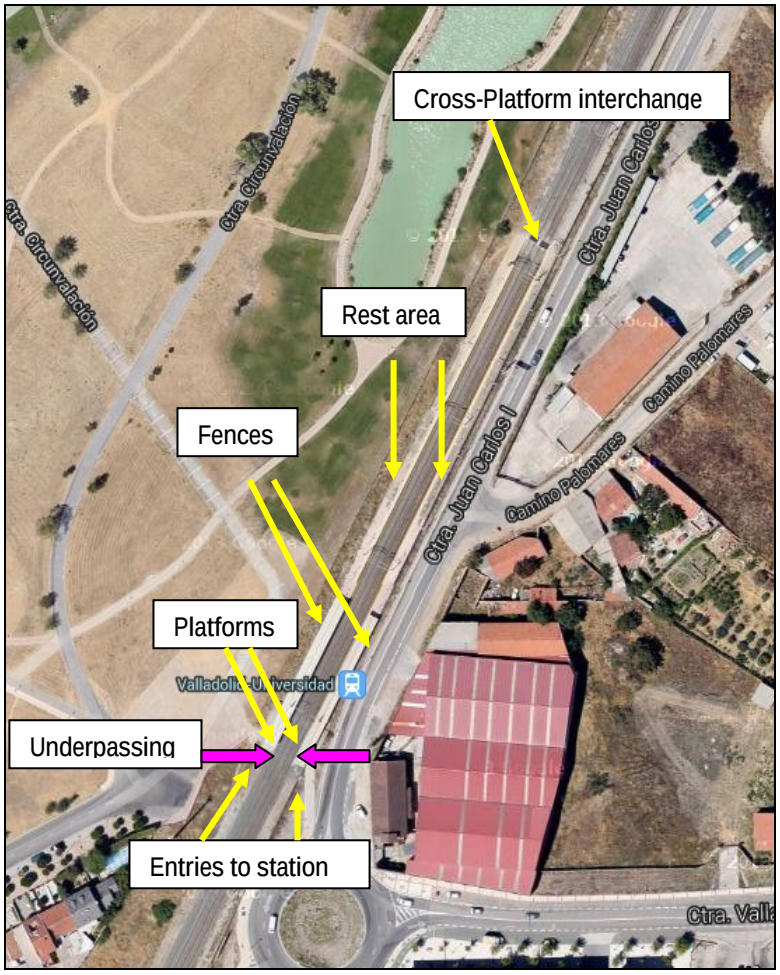

Figure 5.1-2: Valladolid Universidad stopping place in Google Maps.

In order to know with more details the infrastructure of the stopping place monitorised, **Figure 5.1-3** shows the level crossing or cross-platform interchange clearly and the **Figure 5.1-4** shows the underpassing in the stopping place.

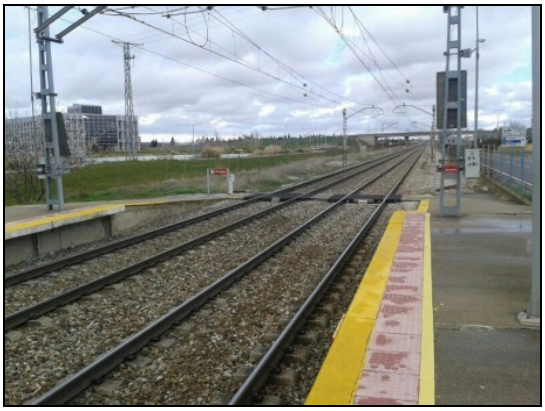

Figure 5.1-3: Legal crossing at the stopping place.

Figure 5.1-4: Underpass: stopping place Universidad.

Warning signs and posters are aimed to deliver information concerning dangers related to trespassing. They should encourage and do not try to prohibit/dictate behaviour. The warning signs selected, for this pilot test, consist of a range of images and texts aiming to convey information about hazards and punishments associated to cross illegally the rails, targeted at preventing trespasses in the railway property. The contents of the final warnings and posters were the following:

A) Warning sign 1: warning about the possibility of being fined for trespassing.

The warning sign regarding the fine for crossing illegally the rails is collected in **Figure 5.1-5** and it is written in Spanish language as it was shown to the people:

Figure 5.1-5: Spanish warning sign referred to the fine for crossing illegally.

The text of the warning sign collected in **Figure 5.1-5** warning sign says in English: *"No trespassing. A fine of up to 6.000€" (Art.40. RD 39/2004 as regards crossing illegally)*". Furthermore, other interesting features of this warning sign are:

- Dimensions: 60cm high x 1,50cm wide
- Location: stuck on the two parallel girders supporting the stopping place roof and opposite to the entries to platforms (**Figure 5.1-8**).

B) Warning sign 2: fine for breaking of the rail fences.

The warning sign regarding the penalty associated to the break of the rail fences is collected in Spanish language in Figure 5.1-6.

Figure 5.1-6: Spanish warning sign related to the break of the fences (in Spanish).

More additional information of this warning sign is collected below:

- This warning sign says: *"Don´t break the fences. Fine up to 30.00€"*
- Material: micro perforated canvas
- Location on the fence near where the fence is broken (Figure 5.1-8).
- Dimensions: (80cm height x 1,90cm wide)

C) Posters: to increase the level of knowledge about the railway culture in order to avoid the most frequent risks.

The real poster referred to the educational aspects about the rail transport is shown in Spanish language in **Figure 5.1-7.**

Figure 5.1-7: Real Spanish poster for rail transport education located at hot spot.

The translation of this poster is collected below:

Do you know…?

…A train needs up to 10 times more in order to break than a car.

…In this stopping place non-stopping trains can circulate at any time of day.

…Trains at 160 km/h can circulate through this stopping place in both directions.

…Bike riding along the platforms and riding through level crossing is forbidden.

AVOID THE RISK. NO TRESPASSING!

And lastly, concerning the location, this poster was located over the underpassing stairs down, wall opposite (**Figure 5.1-8**).

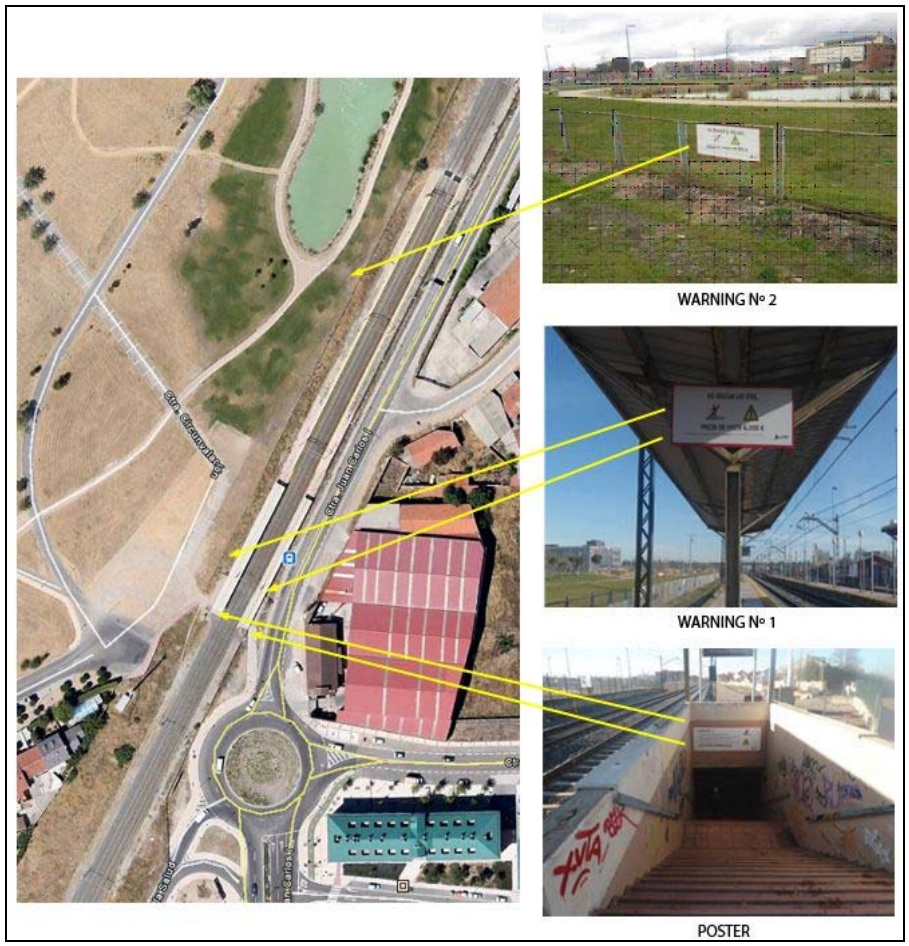

Figure 5.1-8: Location of the preventing measures.

In this case, warning signs and posters are addressed to all residents who live in the proximity of the stopping place and passengers who use it. Most users are adult people and elderly people who usually cross the stopping place to go shopping, working, walking and jogging. Nevertheless, university students and young people usually use this rail zone as well due to the nearness of the University of Valladolid and the university campus for running, cycling and relaxing activities like reading, walking their dogs, etc.

Objectives

The measure selected is intended to discourage pedestrians from using illegal crossing places by providing information concerning the possibility of being fined whether users cross through prohibitive or not authorised places. In other words, the purpose is to reduce the number of

trespassing at Valladolid University stopping place and thereby to reduce the risk of people being hit by a train. In addition, conveying information about the rail culture is another aim too.

Effect mechanism

The hypothesis is that trespassers who have become more aware of the illegality and punishments of their behaviours after reading the warning signs and the poster located at the site, they will avoid crossing illegally in the railway area in the future, avoiding, thus, being fined as well.

Furthermore, it is also assumed that people who have become more aware of the dangers of crossing illegally, they will pay the greatest attention in the future when they cross through the authorised places, and in this case, through cross-platform interchange located at this stopping place.

5.1.2 Previous experiences of similar measures

RSSB (2006), carried out a study based on focus group involving children about the effectiveness of “do not trespass” signs, it was concluded that there is a need to provide information about why trespassing is not allowed instead of only indicate the trespass is prohibited. In addition it was found that redesigned anti-trespass signs based on children’s suggestions were no more effective than existing ones. The study was however very qualitative, with no actual measure of its safety performance. This study also showed that children have a very weak knowledge about rail-related risks.

5.1.3 Implementation

It was planned that the warning signs and posters defined were installed at the stopping place at the end of January, after the collection of data referred to the frequency of trespassing as well as the level of knowledge about safe rail behaviours in the before-period. The measures, warning signs and posters, were foreseen to be in operation for approximately 4 months. The key milestones of the implementation plan are collected in **Table 5.1-1**.

Table 5.1-1: Milestones of the implementation plan.

Date	Work done
April 2013	Preliminary identification of potential test sites based on railway professionals at the ADIF
May 2013	Site visit and preliminary observations of trespassing frequency at potential test sites
July 2013	Definition of the message that will be shown in the posters and warning signs.
Mid September 2013	Production of the signs and posters for the stopping place.
January 2014	Implementation of the signs and posters at the stopping place
January 2014-March 2014	The maintenance of the signs and posters every 15 days
May 2014	Removal of test installations

The pilot test was conducted by CIDAUT, with support from ADIF (Spanish Administrator of the railway infrastructure). ADIF was consulted in the selection of the pilot test site and ADIF also approved all pilot test arrangements. The roles assumed by the involved organisation are collected in **Table 5.1-2**.

Table 5.1-2: Involved organisations and their roles (main responsible organisation first).

Organisation	Role
CIDAUT	– Implementation of the pilot test: wording and production of the posters and warning signs. Measurementt of effects on trespassing. Overall reporting.
ADIF	– Consultation in the selection of pilot test sites – Approval of test sites. Granting permission for implementation of pilot test warning signs and posters. – Definition and approval of the contents of the warning signs and posters.

Concerning the costs of this implementation, the **Table 2.1-1** collects the components of the costs associated to the implementation of this preventing measure.

Table 5.1-3: Costs of the measure

Cost component	Cost (€)
- Costs of production for posters and signs	
Warning sign 1: "No trespassing"	- Cost of definition of contents - Cost of graphic production - Price of printing Total cost of production= Two warnings X2=
Warning sign 2 "Do not break the fences" located in the fences	- Cost of definition of contents - Cost of graphic production: - Price of printing Total cost of production
Poster 1	- Cost of definition of contents - Cost of graphic production: - Price of printing= Total cost of production= Two posters X2=
- Costs of maintenance for posters and signs	
Warning sign 1a	Hours associated to revise the state of warning
Warning sign 1b	Hours associated to revise the state of warning
Warning sign 2	Hours associated to revise the state of warning
Poster 1a	Hours associated to revise the state of poster
Poster 1b	Hours associated to revise the state of poster

Lessons learned:

- Periodically check the condition of the signs and posters, and if needed, make necessary actions to update their conditions.
- Suitably trained staff will be needed to design effective posters and, if needed, make necessary actions to update their condition.
- Be careful with the message “trespassing is dangerous” this could attract possible suicidal persons to the tracks.
- If possible, the posters and signs should be designed and located so that they are not easily accessible to vandalism, including Graffiti.
- Maintenance works on the stopping place were foreseen in mid November. A learned lesson is to get to know the further plans related to the study zone, even, when the operations consist of small interventions in the study area, such as cleanness and maintenance activities.
- An error on the estimation of time in order to get enough number of surveys. It was used the month of November to get enough number of surveys.
- Christmas holidays: not presence of the targeted population at the stopping place.

5.1.4 Evaluation method

The evaluation of safety effects is based on comparison of illegal and unsafe behaviours before and after the warning signs and the poster were set up **(Table 5.1-4).** It is assumed that changes in the frequency of trespassing reflect the effects on the frequency of trespassing accidents and positive attitudes towards avoiding risky behaviours. Taking into account that the train-pedestrian collisions are relatively infrequent, some variables may be less meaningful in the railway field than in others, such as the number of accidents. This variable can be used to measure the effectiveness of traffic engineering treatments at locations where a sufficient number of railway accidents have been reported. However, sometimes in order to have a sufficient number of accidents, several years of study are needed, doing the differences which could find in the accident frequencies, between the before and after periods, could be associated to the treatments implemented, but to other external factors as well. Consequently, alternative measures are needed to evaluate the impact of railway treatments with the aim of avoiding the influence of unknown variables.

According to Korve, Farran, Mansel, Levinson, Chira-Chavala and Ragland (1996), the number of movements by the users that usually present a threat of collision, could be a much better indicator of a location´s accident potential. For that reason, this variable is more frequent and consequently, more recommended as a better safety indicator than the number of accidents.

In addition to this, the underlying assumption will be that the travel behaviour of people in terms of timing or starting point destination in the studied area will not change between the before and after measurements (maximum 3 months), since the frequent users are university students who usually stop here to go to the University of Valladolid and passengers who live in this area of the city and they usually take the train at the same hour every day. Consequently, it is a fair assumption that there will not be changes in both cases, since they are passengers living in one area and using the stopping place to go to the University and go to their work around this railway area of the city

Furthermore, it is important to highlight that this stopping place makes up a connecting area between an outdoor district of the city with the centre of the city, thus, during the date of the evaluation period no changes are foreseen as for the habits of the members of the community during the before and after data collection.

We are aware of the weakness of this type of experimental design, where we compare the frequency of illegal and unsafe behaviours in the before-period to the frequency from the after-period, and assume that the differences reflect the effect of the measure, and ignore any other factors that could have affected the development from before- to the after-period. Therefore the result should be considered only as a rough indication of the effect of the measure.

Table 5.1-4: Description of data collection process.

Data collection period		What (name variables), where, how, target quantity of data
Planned	Actual	
for one week, late Sep–early October	Second week of November, but the surveys were carried out during November	*Pre-intervention (baseline): observations and surveys.* Number of trespassers and unsafe behaviours at stopping place were collected through observation method with well-prepared observers (before-observations). And execution of the surveys will be carried out the after realising the observations.
for one week, April	First week in April	*Post-Intervention 1 (short-term effects): observations and surveys* Number of trespassers and unsafe behaviours at stopping place were collected through observation method with well-prepared observers (before-observations). And execution of the surveys will be carried out the following two week after realising the observations

5.1.5 Collection of evaluation data

Observations

The days of observation were established on the basis of the user profiles of the stopping place and their usual behaviour. For this purpose, it was carried out a pre-study in order to detect the usual behaviours and the times of more presence of passengers and users. As result of this, observations were established from 09.00 am to 19.00h pm on four consecutive days, from Wednesday to Saturday, when the main type of illegal and unsafe behaviours of this stopping place were observed. The main users of this stopping place could be grouped in the following categories:

- First group: university students who usually stop here to go to the University of Valladolid and passengers who live in this area of the city and they usually take the train at the same hour every day.
- Second group: users (pedestrians, cyclists, joggers and motorcyclists) who usually go across this stopping place to go University or their work.
- Third group: the elderly, cyclists and joggers crossing this rail area to get a long green park where they can carry out their recreation activities such as walking, riding bike and jogging.

Bearing in mind all this information, the periods of observations are collected in **Table 5.1-5.**

Table 5.1-5: Observations periods and the times before and after study.

Time	Wednesday	Thursday	Friday	Saturday
Morning				
09.00-10.00	x	x	0	x
11.00-12.00	x	x	x	x
Afternoon				
13.00-14.00h	x	x	x	x
14.00h-15.00h	x	x	x	x
16.00-17.00	x	x	x	0
17.00-18.00	x	x	x	x
18.00-19.00	x	x	x	x

One unnoticed and trained observer was located at each platform during the four days of observation. Each observation day was divided into seven observation hours on the basis of the pre-study, except the observation time form 09.00 to 10.00h on Friday and from 16.00h to 17.00h on Saturday because of ADIF workers were on the rails, and thereby, this situation could affect the actual behaviours of the users (**Table 5.1-5**). The observers collected separately the legal and illegal behaviours carried out in the stopping place. To check the reliability of the observations after each period of observation, the recordings were checked out among both observers.

Survey

The surveys were conducted from 09.00 am to 19.00 pm the following week after the observations in both periods of the study. The surveys were carried out on one hand, at stopping place, including students and workers using the commuter trains and the users who usually cross this stopping place to go the university or their works as well as people crossing this area to get the long green park in order to carry out different recreation activities (Survey before installing the measure: n=107; and after the installation: n=105) and on the other hand in one community center near stopping place (before installing the measure: n= 55 and after: n=38). A total of 162 forms were carried out prior to the intervention and 143 after the intervention. Concerning the interviewees, people form the community centre were the same before and after surveys and the most people interviewed at the stopping place were the same too (around 88%).

The questions of the survey concentrated on perceptions of safety and illegality, frequency of walking across the tracks and using the level crossing and underpassing. Perceptions of how safe it was to walk across the tracks with or without a train approaching were measured on ratio-scale from 1 (Never Safe) to 9 (Always Safe). Knowledge of illegality was measured by a question asking if participants thought that it was illegal to walk across the tracks, with three response categories available: (1) Don't know; (2)Yes, it is against the law and (3) No, it is not against the law. In addition to this, when the interviewee answered "yes", another question was formulated referred to the fine: (1) "No fine, you are warned that it is illegal, (2) fine lower than 6000€, (3) fine higher than 6000€ and (4) prison. Furthermore, one question about illegality of breaking fences and punishment associated was asked too. Last, four questions concerning the railway culture was carried out.

5.1.6 References

Korve, H.W., Farran, J.I., Mansel, D.M., Levinson, H.S., Chira-Chavala, T., & Ragland, D.R. (1996). *TCRP Report 17: Integration of Light Rail Transit into City Streets*. Washington, D.C.: TRB, National Research Council.

RSSB. (2006). T555 Improving the Content and Placement of Anti-trespass Signs (Final Report No. T555): Halcrow Group Limited in partnership with Human Engineering Limited.

5.2 Pilot test 2: Railway safety education programme

Author: Sarah Whalley / FFE team (FFE)

5.2.1 Description of the measure

Overview

This measure is a Railway Safety Education Programme targeted at primary school children (aged 8 to 10 years) and primary school teachers, to raise awareness about the dangers and consequences of railway trespassing and how to be safe in the railway environment.

The programme comprised the delivery of railway safety workshops to both teachers and pupils. These took place at the two national railway museums in Spain (Madrid and Cataluña) and at three primary schools in the city of Alicante. All of the schools that participated are located in close proximity to a railway line and have exposure to the problem of railway trespassing in their community.

At the museums the workshop was offered to school groups as part of their trip to the museum. In Alicante the City Council, in coordination with Adif (the Spanish infra manager), offered the workshop to schools in response to an identified problem with railway trespassing in the city.

The workshop was designed to encourage the active participation and reflection of the participants leading them to understand:

- The risks and dangers of crossing and/or playing on or near the train tracks.
- Potential consequences of railway trespassing.
- How to act safely when in stations, level crossings, railways and how to cross the tracks safely.

Whilst both teacher and pupil workshops shared common learning objectives (as above) the aim of working with teachers was to reinforce and strengthen the railway safety message with pupils and thus the impact of the measure. It aimed to do this by raising the school teachers´ awareness of the dangers of railway trespassing and providing them with information and tools to work on this topic in their classes.

The 8–10 year age group was selected based on the need to prepare this group with the safety skills that they will need for the next stage in their independent development. As teenagers the pupils will be more vulnerable to acting out high risk behaviour, such as trespassing on railway property, therefore intervening at an earlier age will help to shape attitudes that will influence safer behaviour in the future.

The design of the programme materials and workshop development was carried out by the FFE research team, based on an extensive review of existing railway safety education programmes and consultation with education and railway safety experts: Spanish Railway Museum learning teams, Education Department of the Autonoma University of Madrid, Railway Infrastructure Manager, Alicante City Council, York National Railway Museum and British Transport Police[2].

[2] In addition, the Infrastructure Manager (ADIF) and Alicante City Council collaborated in the development of the pilot in Alicante).

The FFE research team were also responsible for delivering the pupil and teacher workshops at the museums and primary schools.

Objectives

The measure aimed to positively influence the behaviours and habits of children and young people towards acting safely around railways, preventing risky behaviour related to trespassing, thus reducing the possibility of trespassing accidents and incidents.

The measure sought to achieve this aim by providing the workshop participants with knowledge and information about the risks and dangers of railway trespassing and the skills to make informed and safe choices about how to cross the tracks and act safely around railways.

The specific objectives to influence these behaviours are:

- Develop attitudes about safety on trains and railways.
- Improve knowledge and awareness of safety on railway property, including the dangers and consequences of games and / or inappropriate activities on / near the tracks.
- Teach personal skills, such as awareness of danger / risk and safety on the tracks, knowing how to be safe in railway environments and how to cross the tracks safely.

In support of this objective the measure also aimed to raise teachers´ awareness of the importance of teaching railway safety at school and to provide them with the knowledge and tools to do so. By working with schools the measure sought to reinforce and strengthen the rail safety message to pupils by supporting its continuity through the school curriculum. In this way the workshop is not necessarily a one off action but sustainable through time, leading to a greater scope for impact.

Effect mechanism

The hypothesis is that if the participants understand the risks and dangers of railway trespassing and know how to act safely within the railway environment they have the potential to make informed and safe choices about how to cross the railway tracks and act on railway property. In addition, by working with the adults responsible for and influential in the children´s education (teachers) it will help to reinforce and strengthen the rail safety message amongst the young participants.

Given the preventative nature of the measure and the fact that the effects could manifest at any place or time in the participant´s life, the Theory of Change logic mapping approach to implementation and evaluation was chosen. Theory of Change defines all building blocks required to bring about a given long-term goal. This approach allows the evaluator to see the progress made along an anticipated path towards the final impacts, even in the event that it is not possible to gather evidence that this has been achieved.

This set of connected building blocks is depicted on a map known as a pathway of change or change framework, which is a graphic representation of the change process. The change framework follows the steps of a logic map (**Figure 5.2-1**) which illustrates the different assumptions of the changes which are expected to occur as a result of the intervention and collects data on the assumed impacts (e.g. the knowledge of school children on the danger of trespassing) that are anticipated in both the short and longer term.

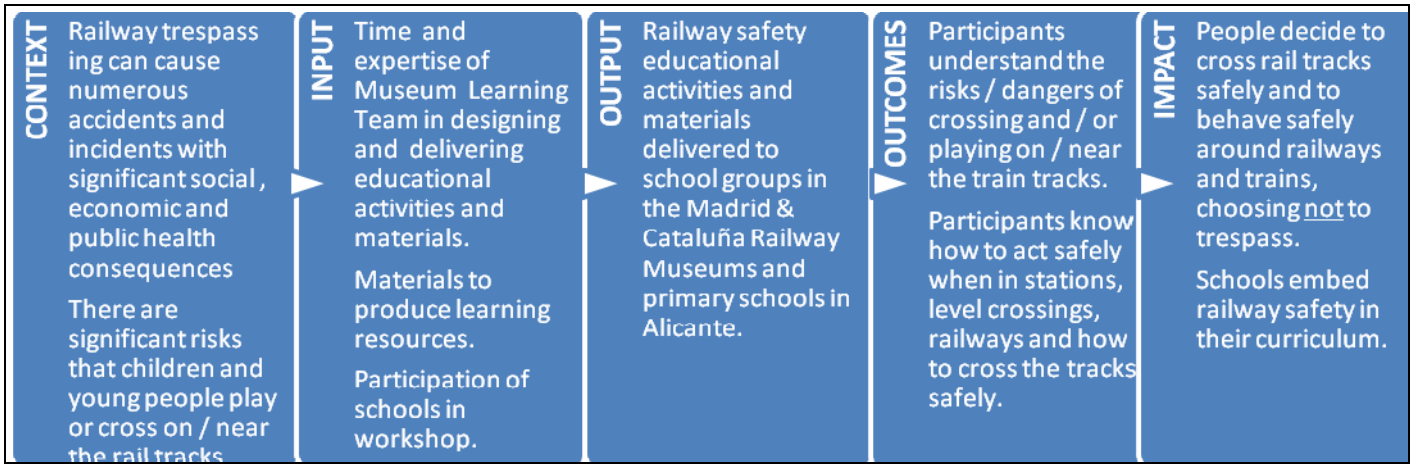

Figure 5.2-1: Steps following the change framework and their assumptions.

5.2.2 Previous experiences of similar measures

The development of the workshop materials was based on an extensive review of existing railway safety education programmes and materials used in countries such as: Canada; USA; Australia; New Zealand and Great Britain and road safety education materials from Spain. Activities include: workshops, talks from railway and safety staff, lesson plans, rail safety songs, safety video campaigns, designated railway safety websites, leaflets, activity booklets, posters, interactive games, stories etc (see reference section for links).

Of particular relevance for the Railway Safety Education Programme is Trackwise, an interactive rail safety workshop for children and young people run at York National Railway Museum delivered in partnership with the British Transport Police (BTP). Consultation with the British Transport Police who run the rail safety workshop at the museum, provided some useful information and best practice lessons which were taken into account when planning the Railway Safety Education Programme pilot.

5.2.3 Implementation

The Railway Safety Education Programme was implemented in three locations in Spain (marked on the map with a yellow circle; **(Figure 5.2-2)**:

- Madrid: Madrid Railway Museum (Museo del Ferrocarril de Madrid Delicias), which is housed in an old railway station located just metres from the current operating railway line.
- Cataluña: Cataluña Railway Museum (Museo del Ferrocarril de Cataluña), which is housed in an old steam locomotive depot next to a railway station and track (on a stretch of line where there is a problem with trespassing).
- Alicante: 3 Primary schools.

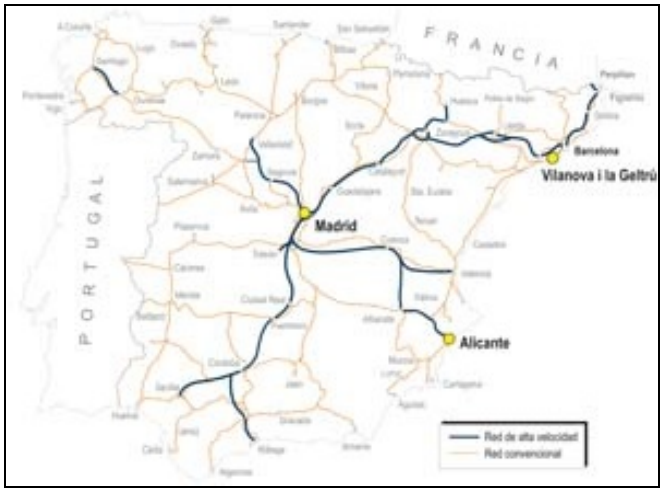

Figure 5.2-2: Map of pilot implementation sites in Spain (map also shows Spanish conventional and high speed railway network) (source: FFE Grupo de Geografía y Tráficos Ferroviarios).

In total, the Railway Safety Education Programme was implemented in 6 primary schools throughout Alicante, Cataluña and Madrid. These schools were:

- Escola l'Arjau School (Cataluña); located in a coastal town approximately 100 metres from the railway line.
- Escola Llebetx primary school (Cataluña); located in a coastal town approximately 100 meters from the railway line.
- Gabriel Miró Public Primary school (Alicante); located within a coastal city approximately 5 metres of the railway track (see Figure 5.2.2. below).
- Jorge Guillén Public Primary School (Madrid); located within a town on the outskirts of Madrid just 600 metres from the railway track.
- José Carlos Aguilera Public Primary School (Alicante); located within a coastal city approximately 300 metres from the railway line.
- San Francisco de Asis Public Primary School (Alicante); located within a coastal city approximately 200 metres of the railway track.

The proximity of the railway line to Gabriel Miró school (Alicante) can be appreciated in the photo (**Figure 5.2-3**; left) which was taken from a classroom window. The school yard is within a few metres of the track (approx. 5 metres), divided by a rough path which is lined by a fence to prevent access to the railway line. However as can be observed in the second photo (**Figure 5.2-3**; right) there is a large hole cut into the fence which is directly opposite the school yard.

Figure 5.2-3: View of Gabriel Miró School yard in relation to the railway line (left) and image of hole in fence opposite Gabriel Miró School yard (right).

School engagement

Different mechanisms were used to engage the schools at the three implementation sites.

In Cataluña the Railway Museum worked together with three Local Education Resource Centres (all areas with an identified issue with railway trespassing): Garraf; Vilanova I la Geltrú; and Mataró. These centres contacted and invited all the schools in their catchment area to participate in the study. The teachers participating in the workshop in Cataluña were awarded professional teacher training credits to incentivize their participation.

In addition to this, information on the pilot project was sent out to all Local Education Resource Centres at a regional level in order to give a wider dissemination of the RESTRAIL project.

An additional incentive of free railway tickets to the museum was offered by Renfe (the Spanish railway undertaking). In the end this offer was not taken up by participating schools as they are located within walking distance of the museum.

In Alicante, the City Council identified priority schools to be included in the study, based on their proximity to the railway lines. These schools were contacted by the council and invited to participate in the study. Once confirmation had been received FFE proceeded to contact the schools directly to organize the workshops.

In Madrid, schools who had signed up for a museum visit were invited to participate in a free railway safety workshop.

The Railway Safety Education Programme comprised a total of two teacher's workshops (in two locations: Cataluña and Alicante) and nine pupil's workshops (in three locations to 6 different schools) which were delivered by the FFE researchers (**Table 5.2-1**). In total, 27[3] teachers and 271 pupils participated in the programme. The pupils were from Grade 3 (8–9 years) and 4 (9–10 years) a certain percentage of whom had special learning needs.

[3] Of the total 27 participants, 22 were primary school teachers and 5 were members of educational staff from two different organizations: Cataluña Railway Museum Learning Team and Mataró Local Education Resource Centre.

Table 5.2-1: Summary of workshop participation (teacher and pupil).

Time	Place	Type and number of workshops	Participants
21st January, 2014	Cataluña	Teacher workshop (1)	7 teachers
5th February, 2014	Cataluña	Pupil workshop (3)	99 pupils (44 female; 55 male)
5th March, 2014	Alicante	Pupil workshop (1)	24 pupils (10 female;14 male)
5th March, 2014	Alicante	Teacher workshop (1)	20 teachers
6th March, 2014	Alicante	Pupil workshop (3)	74 pupils (40 female; 33 male)
19th March, 2014	Madrid	Pupil workshop (2)	74 pupils (38 female; 36 male)

Teacher workshops

The teachers´ workshop, (2 hours), was designed using real life materials (e.g. statistics, newspaper articles, video footage and prevention campaigns) and sought to stimulate the reflection and participation of the teachers regarding the following questions (see examples of teachers' workshop materials in **Figure 5.2-4**).

- Who trespasses and why? (based on television interviews with people who cross the railway tracks in unauthorised locations, newspaper articles, CCTV footage.)
- What are the risks of railway trespassing? (presentation of facts and figures regarding railway operations: train speed, weight and stopping distance...).
- What are the specific risk factors for children and young people? (discussion regarding specific risk factors for young people with reference to images)
- What are the consequences of railway trespassing? (drawing on information presented in the materials).
- How can railway trespassing be prevented? (review of existing campaign materials, including Dumb Ways to Die video from the Melbourne Metro).

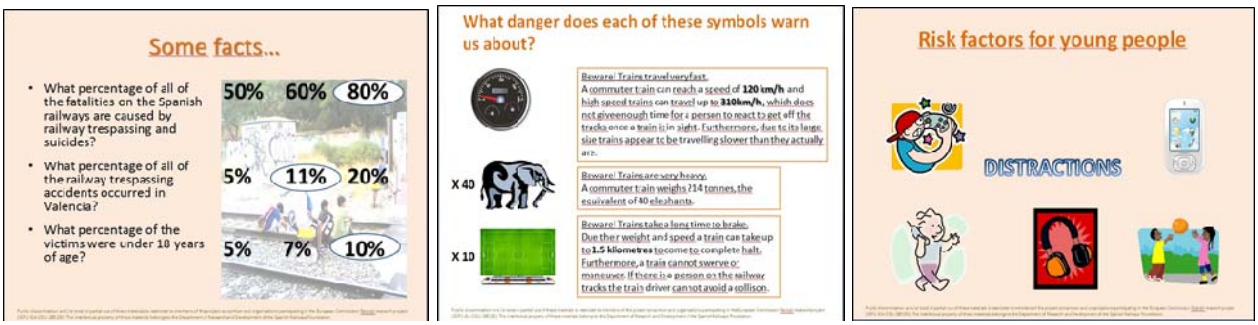

Figure 5.2-4: Example materials teacher workshop.

Pupil workshops

The pupil workshop was designed to encourage the active participation of the pupils and their reflection on the dangers of being on or near the tracks and how to cross the tracks safely. The key lessons to be learnt through the workshop were presented in a contextualised way with the help of Daniela, a character that was designed specifically for the railway safety education programme pilot. By creating Daniela the measure sought to communicate the rail safety message in a more effective and accessible way by using a character with whom the pupils might more easily identify.

For example, the pupils had to help Daniela and her friends safely cross a railway line on the way to school and to spot the dangerous behaviour at a railway station.

Key facts and figures about trains were presented through a quiz which required the pupils to first think about the information presented before receiving the safety message from Daniela. In order to further encourage the pupils´ involvement in the workshop and reinforce the safety message, the workshop participants from the class were asked to read out loud the lessons taught by Daniela (see examples of pupils' workshop materials in **Figure 5.2-5**.

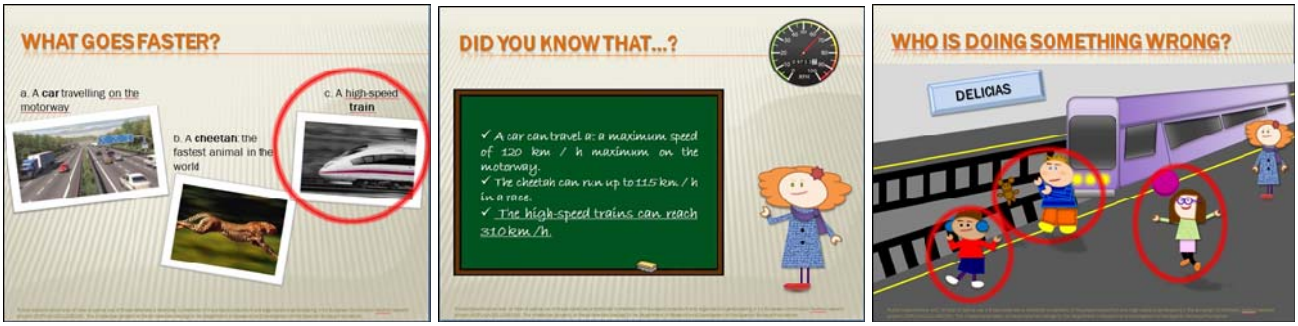

Figure 5.2-5 Example material: pupil workshop quiz (left) and pupil workshop Daniela (middle) Spot the unsafe behaviour activity (right) (translated from Spanish into English).

Throughout the workshop, discussion questions were used to provoke the pupils´ reflection regarding the information presented and its application to how to stay safe around trains. For example, following the presentation of facts about the speed, weight and stopping distance of trains, students were asked why they thought a train takes up to 10 football pitches to come to a halt and the implications of this for a person on or near the rail tracks.

All of the key lessons were summarised again at the end of the workshop in a powerpoint slide, together with a review of the initial pre-evaluation exercise, where Daniela told the pupils which of the three routes were correct/incorrect with the workshop leaders asking the pupils the reasons why.

The involved organisations and their roles are described in **Table 5.2-2**

Table 5.2-2: Involved organisations and their roles (main responsible organisation first).

Organisation	Role
Spanish Railways Foundation (FFE)	– Design and preparation of rail safety educational materials and evaluation tools. – Delivery of rail safety workshop with teachers and children. – Collection and analysis of evaluation data.
Madrid and Cataluña Railway Museums	– Communication with schools and teachers. – Provision of feedback on educational materials. – Provision of space to deliver rail safety workshop. – Support in delivering workshop at the museum.
School teachers	– Participation in teacher workshop – Facilitation of pupil workshops – Completion of evaluation
Adif (IM)	– Liaison with key stakeholders (e.g. city councillors, schools) to set up rail safety workshop in schools/ educational centres.
Alicante Council	– Selection and contact with the participating schools.
Autonomous University of Madrid (Teacher training department)	– Advisory on the development of the educational materials

Costs

The implementation costs of this measure are mainly related to the working time of people from involved organisations (planning, preparation and delivery of the learning material, engaging the target audience and organising and coordinating the workshops). The working time of the museum staff, ADIF (the Spanish infra manager), Alicante City Council, teachers and the university are in kind contributions.

Lessons learned

In terms of operational and process issues a number of lessons were learnt that can be applied to future planning and implementation of a measure of this nature.

- It is important to have the involvement of teachers and schools in order to support the continuity of the measure and in this way its potential for impact. To this end it is necessary that teachers are supportive of the initiative, by understanding the issue of railway safety and the importance of transmitting this message at school. This requires a phase of teacher training. The ultimate objective would be for schools to incorporate teaching about railway safety education within their school curriculum.
- Despite the fact there is no current provision, there appears to be a demand for railway safety education at school, based on the high level of interest shown by the participants. There is a likely connection between the interest shown by the schools and their close location to railway lines and a trespassing hotspot(s). In many cases teachers have had direct or indirect experience of railway trespassing or even trespassing incidents and accidents within the local area. In particular there is a demand from teachers for rail safety workshops targeting the adolescent age group, who are at risk of trespassing on railway property.
- Some schools that were contacted were not able to participate despite their interest due to time constraints within the school programme. In this way it is very important to have

sufficient lead up time when contacting schools (spring term of the previous academic year) so that the workshop can be scheduled within the school curricular or extracurricular planning.

- Developing and delivering the pupil's workshop in a student centred way using the Daniela character was effective in engaging the participants in the subject and encouraging them to really think about the issues. Indeed the enthusiasm of the pupils to participate in the activities could be observed in all of the workshops delivered. Pupils appeared to enjoy the quiz where interesting facts about trains were presented and the pupils were anxious to know if their answer was correct. This also served as a pretext for teaching about the dangers of being on or near the rail tracks (e.g. the speed, weight and stopping distance of trains). Structuring the learning content around questions directed at the pupils not only encouraged their active participation in the session but also helped them to reflect and analyse the issues raised, setting a context for learning.
- Awarding a certificate of participation at the end of the workshop was also well received by the pupils and serves a double purpose of communicating the workshop learning to the family.
- Working through an established communication channel supported the engagement of schools. In the case of Alicante, the City Council made the initial contact and then provided direct contact details of the head teachers. In the Cataluña Railway Museum, schools were contacted via their local educational resource centres (their usual engagement mechanism) and in Madrid, schools who had signed up for a museum visit were invited to participate in a free railway safety workshop.

5.2.4 Evaluation method

Teacher workshop

The evaluation of the teacher workshop sought to assess participants´ knowledge and attitudes regarding the importance of teaching railway safety and the dangers of trespassing within the school curriculum and their confidence to do so.

A self-completion questionnaire was distributed to participants at the end of the workshop which covered the following:

- Existing provision of rail and road safety education at the school.
- Perception of the importance of teaching railway safety and the dangers of railway trespassing at school before and after participation in the workshop.
- Level of confidence and capacity to teach railway safety at school before and after participation in the workshop.
- Level of satisfaction with teacher´s workshop.

The questionnaire was distributed at the end of the session and included some retrospective questions (e.g. perception of importance of teaching railway safety at school before and after participation in the workshop) instead of carrying out a separate additional pre-evaluation questionnaire at the beginning of the workshop. Furthermore, in order to gauge perceptions and attitudes regarding railway safety education, at the beginning of the session teachers were asked about their interest and motivation for participating in the workshop.

A follow up questionnaire was sent to schools in Cataluña and Alicante to find out if they have implemented further railway safety activities in their class since taking part in the workshop or plan

to do so during the next academic year. Responses were received from four of five participating schools.

Pupil workshop

The evaluation of the pupil workshop sought to gauge the change in the knowledge, attitudes and behaviour of the students regarding railway safety. Perceived safety within the railway environment (crossing, standing near or on the tracks)

- Perceived illegal crossing: knowledge or beliefs about legality of crossing
- Changes to the attitudes, understanding and awareness of the risks of railway trespassing, based on information and facts about trains and the railway environment (with reference to the specific learning objectives).
- Acquisition of personal skills, such as how to act and stay safe in railway environments.

The baseline assessment of pupils´ knowledge, attitudes and behaviour regarding crossing the railway tracks safely was evaluated at the beginning of the session before starting the workshop, using a scenario involving a character called Daniela. The students were asked to help Daniela get from her house to school by choosing one of three possible routes (see **Figure 5.2-6**). All routes involved having to cross a railway track. Two of the options involved crossing the track in unauthorised and dangerous places and one option involved using a bridge.

At the end of the workshop in order to assess the knowledge acquisition of the pupils this same exercise was repeated along with a series of true or false questions about the information presented in the workshop.

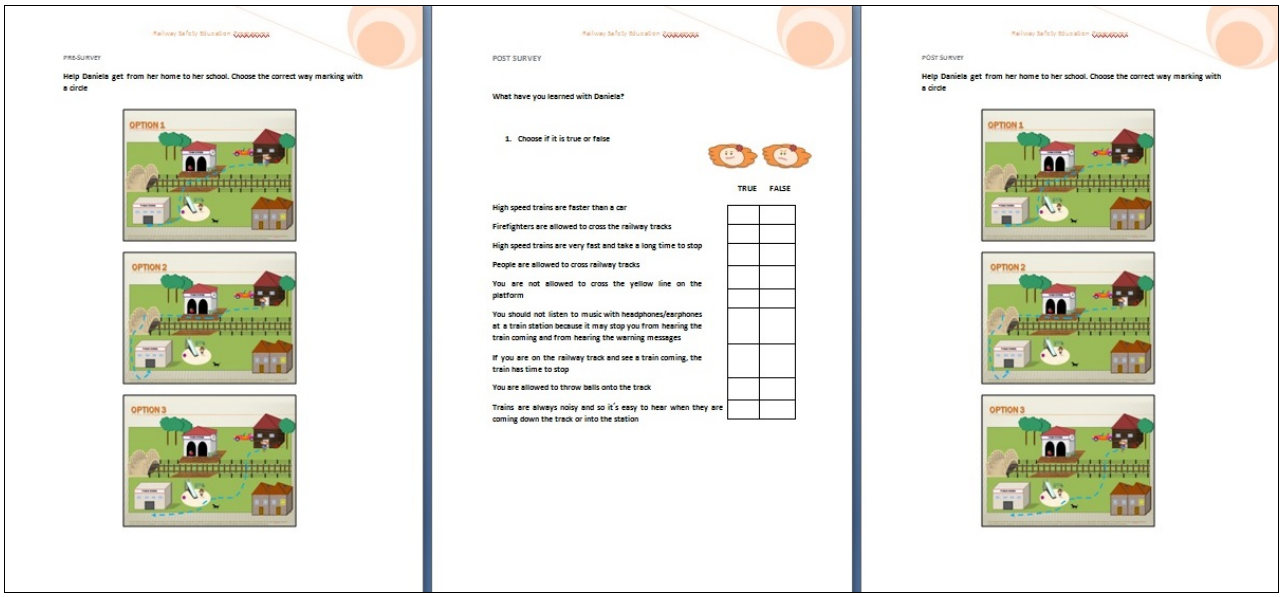

Figure 5.2-6: Pupil pre-evaluation and post-evaluation tool.

The exercises were completed anonymously and the answers of the exercise with Daniela and the series of questions (baseline and post-workshop) were not matched to individual students.

The follow up questionnaire sent to schools included a question regarding the feedback or comments students might have made following their participation in the workshop.

A monitoring form was used in each of the workshops to collect data: name and location of school, number of participants (by sex), and age of participants and observations/good practice/lessons learnt

5.2.5 Collection of evaluation data

Evaluation data

In total 27 participants from the teachers workshop completed the self-completion evaluation questionnaire at the end of the session. This survey tool included retrospective questions, regarding knowledge and attitudes before and after the workshop.

A follow up questionnaire was sent to schools in Cataluña and Alicante to find out if they have implemented further railway safety activities in their class since taking part in the museum workshop or plan to do so during the next academic year.

In total, 271 school children participated in the workshop and filled in the Daniela exercise pre-workshop survey (baseline knowledge and attitudes) and post-workshop survey (to measure impact on knowledge acquisition). The researchers leading the workshop provided instructions on how to complete the tool (and one to one support where needed). Both the pre-assessment and post-assessment surveys were self completion.

5.2.6 References

Canadian National Railway Company. CN All Aboard for Safety / Little Obie - CN's Safety Train: https://www.cn.ca/en/delivering-responsibly/community

Cornwall Council, UK. Teaching your child road safety: http://www.cornwall.gov.uk/transport-and-streets/road-safety/road-safety-pedestrians/child-pedestrians/teaching-your-child-road-safety/

ILCAD: http://www.ilcad.org/Videos.html

Fundación MAPFRE. Niños y Seguridad Vial para niños de 6 – 11 años. (Road safety resources for children 6 – 11 years): http://ninosyseguridadvial.com/

Melbourne Metro Trains. Dumb Ways to Die song: http://www.youtube.com/watch?v=aJfWZTqmGKg

National Railway Museum. Trackwise Interactive rail safety workshop: http://www.nrm.org.uk/Education/Events/trackwise

Network Rail. Rail-life website for young people: http://rail-life-talk.tumblr.com/

Network Rail. Rail safety website and teaching resources: http://www.networkrail.co.uk/safety-education/primary-school-resources/

Parachute. Safe Kids Canada website: http://www.safekidscanada.ca/

Rail Safety and Standards Board (RSSB). Rail safety website and resources: http://www.trackoff.org/

The Center for Theory of Change, Inc: http://www.theoryofchange.org/about/what-is-theory-of-change/

Track Safe New Zealand. http://www.railsafety.co.nz/index.html

5.3 Pilot test 3: Education at schools for 8–11 year old children

Author: Anne Silla (VTT)

5.3.1 Description of the measure

Overview

School children in selected schools located close to railway lines in age group 8–11 years in and near the city of Tampere were given a 45 minute lesson about safe behaviour in railway environment. The main message of the lesson was that the railway lines are only meant for trains. After the lesson the school children should understand:

- the main characteristics of railway traffic (railway lines are only meant for railway vehicles, trains cannot yield, trains cannot stop fast, trains have always the priority etc.),
- that trespassing, playing and loitering in the railway areas are forbidden, and
- that they have the responsibility to behave safety in the railway environment.

The lesson plan includes a) the main safety message of the lesson, b) general description of what the children are expected to learn, c) objectives of the lesson, d) description of the teaching materials and tools which can be used, e) instruction on teachers how to prepare themselves for the lesson, f) support on how to motivate the children to listen and participate and g) activities to be conducted during the lesson (including some variations by age groups). The lesson plan and other supporting material are based on the material provided by the Finnish Transport Safety Agency in their website (http://www.rautatieturvallisuus.fi/rautatieturvallisuus, in Finnish). This specific website for railway safety education includes several lesson plans for primary and secondary school teachers to be used during the school year. The Finnish Transport Safety Agency is not aware of the level of usage of the material by the teachers.

The material in the website of the Finnish Transport Safety Agency is strongly based on the material prepared by the Operation Lifesaver, which is a non-profit state-based organisation providing public education programmes to prevent collisions, injuries and fatalities on and around railway tracks and level crossings (Operation Lifesaver 2013). Operation Lifesaver was founded in 1972 in U.S. and during the years it has spread to several countries such as Canada, Mexico, UK and Estonia.

Objectives

The objective of this measure was to increase the knowledge of school children about the safe behaviour in the railway environment and thus to reduce the vandalism, risky situations and possible accidents resulting from railway trespassing (playing, loitering, taking a short cut across the tracks etc.).

Effect mechanism

The hypothesis is that (at least some of the) school children who participate the lesson become more aware of the dangers related to railway trespassing and of the dangers related to railway lines in general and thus in the future they would avoid playing, loitering and vandalising in the railway area and/or avoid taking a shortcut across the tracks.

5.3.2 Previous experiences of similar measures

Several railway safety education programmes exist worldwide to provide material to teachers and volunteers to spread information about the dangers related to railway trespassing and loitering in the railway areas and also to provide information on safe behaviour in railway environment directly to children. These kind of websites can be found e.g. in U.S. in UK, in New Zealand and in Australia (see **Table 5.3-1**).

Table 5.3-1: Examples of websites providing education material to prevent railway trespassing.

Country	Organisation	Website	Content	Target group
Finland	The Finnish Transport Safety Agency	http://www.rautatieturvallisuus.fi/rautatieturvallisuus (in Finnish)	Lesson plans, material for parents	Children in primary school (7–12 year old)
U.S.	Operation Lifesaver	http://oli.org/	Lesson plans, safety tips	Children starting from pre-school till 12th grade
UK	Network rail	http://www.networkrail.co.uk/safety-education/	Lesson plans, material for parents	Children in primary and secondary school
	Network rail	http://www.rail-life.co.uk	Videos, advice, railway safety information	12 to 17-year-olds; created by young people for young people
	RSSB (on behalf of the railway industry)	website: http://www.trackoff.org/	Teaching material, statistics, leaflets	Young people
New Zealand	New Zealand Transport Agency	http://www.railsafety.co.nz/education.html	Lesson plans	Children in pre-school, primary school or secondary school
	New Zealand Transport Agency	https://education.nzta.govt.nz/resources/primary-curriculum-resources/rail-safety	Education portal	Children between 5–12 years
Australia	Sydney Trains	http://www.sydneytrains.info/travelling_with/safety_and_education/schools_program	Workshop material	9 to 10 year old children (can be tailored to suit any students' needs)
	Tracksafe	http://www.tracksafeeducation.com.au	Teaching material and guidelines	Primary and high school students
		http://www.beonthesafeside.com.au	Information on safe behaviour	Primary and high school students

According to the website of Operation Lifesaver (Operation Lifesaver, 2013) and the websites of national railway organisations (e.g. Prorail in the Netherlands, Network Rail in UK, Kiwirail in New Zealand) several campaigns have been conducted to increase the knowledge of people, especially young people, on the dangers and regulations related to railway trespassing and loitering in the railway areas. However, there are few if any studies investigating the effectiveness of the education campaigns to prevent railway trespassing. Savage (2006) investigated the effect of Operation Lifesaver activities on the number of collisions and fatalities at level crossings. He found out that the increasing amount of educational activity will reduce the number of collisions, but the effect on the number of deaths cannot be concluded with statistical certainty. The analysis included only level crossing accidents and thus the effect of education on trespassing fatalities remained unknown.

There are two studies from New Zealand (Lobb et al., 2001; Lobb et al., 2003) which have evaluated the effect of education programmes to prevent railway trespassing. The first study (Lobb et al., 2001) evaluated the effect of public education combined with access prevention by fences to reduce trespass at a suburban station in Auckland targeting people at all ages. The results showed that immediately after the interventions the frequency of trespassing fell from 59% to 40% and after three months the decrease was sustained and even slightly enhanced (from 40% to 36%). Moreover, the reduction was higher for adults (from 65% to 37%) than for children (from 47% to 34%). The other study (Lobb et al., 2003) assessed the effects of railway safety education, continuous punishment and intermittent punishment on reducing the railway trespass. The target group included students in secondary/high school. Lobb et al. (2003) concluded that punishment may be more effective than education in reducing unsafe behaviour (i.e. unsafe crossings) in the vicinity of railway stations, and substantially more effective than communication in raising awareness. In both of the studies the educational programmes where combined with other measures and thus the effect of the pure educational campaign is not clear.

Safety education programmes are also widely used in road safety. The literature review on the effectiveness of road safety education conducted by Dragutinovic & Twisk (2006) show that although a large number of road safety education programmes exist, the number of programmes that is followed by thorough evaluations, is rather limited. They also found out that most evaluation studies use intermediate variables such as knowledge, attitudes and (self-reported) safe behaviour as evaluation criteria instead of crashes. Twisk et al. (2014) argue that several characteristics of crashes weaken their usefulness as outcome criteria in evaluations. First, crashes and injuries remain rare events in the population of road users. Only an extremely small proportion of risky behaviour actually results in a crash. Secondly, in order to have a sufficient statistical power to demonstrate an effect on crash-related outcomes, an education programme would require a large number of participants and the monitoring of crash and injury records of the participants over a long period of time. This is neither practical nor ethical.

5.3.3 Implementation

The lessons were held in four schools which are located in close proximity to a railway line in the area near city of Tampere (**Figure 5.3-1**). The distance between the schools and the railway line varies between 100 and 500 meters.

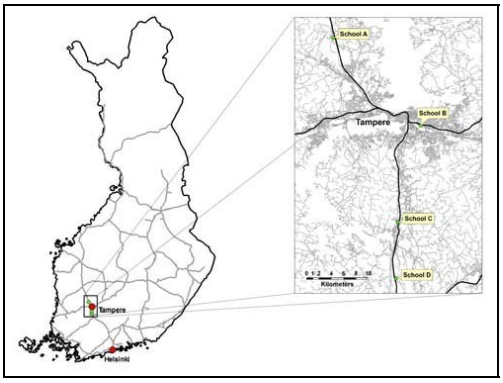

Figure 5.3-1: The Finnish railway network including a detailed picture of Tampere area.

The proposal on the school to be included in this study was made by the experts of the Finnish Transport Agency. The selection of schools was based on the school's proximity to railway lines as well as the fact that Tampere area has been identified as a problem location concerning vandalism.

The principals of each school were contacted on May 2013 and five out of the six proposed schools agreed to participate in the education campaign. Unfortunately one of the schools decided to withdraw from the study in a later phase and thus four schools formed the final target audience.

The planning and preparation of the lesson material and the instructions to teachers was conducted during June–July 2013. The lesson plan, supporting material and instructions to teachers were sent to the principals of each school in September 23rd in 2013. The principals were responsible for delivering the material to the teachers. The request was to hold the lesson to children in 2nd, 3rd and 4th grade in each school (8–11 year old children). The principals of each school could independently decide the number of groups which was participated the education campaign (in case there was more than one group per grade).

The lessons were held by teachers of each class during September–November 2013.

The involved organisations and their roles are described in

Table 5.3-2.

Table 5.3-2: Involved organisations and their roles (main responsible organisation first).

Organisation	Role
VTT	– Responsible for preparing the material for the lesson and the instructions to the teachers – Responsible for the communication with the principals, provision of any support to the teachers when needed
the Finnish Transport Agency (infra manager)	– Proposal on the possible schools to be included in the study – Provision of comments to the content of the material which will be sent to the principals
the Finnish Transport Safety Agency	– Provision of the material. The material prepared by the Finnish Transport Safety Agency was used as a basis for the material used in this study – Provision of comments to the content of the material which will be sent to the principals
School teachers	– Responsible for holding the lessons

The implementation costs of this measure are mainly related to the working time of people from involved organisations (planning and preparation of the material and instructions, planning and contacting the target audience, distribution of the material, provision of support to teachers when needed) plus the working time of teachers (preparation and conducting the lessons). The costs related to the preparation of the original lesson plans (available in the website of the Finnish Transport Safety Agency) which were used as a basis for the developed material were not included in the calculations.

If the target audience is extended the additional costs are related to the working time of teachers and to the administration of the lesson material (one organisation that stores and updates the lesson material). The preparation costs will not recur unless the content is modified.

5.3.4 Evaluation method

The study was conducted as a before-after study with no control data. The inclusion of control group was discussed but at the end it was not included. The short survey included only few questions and thus the researchers assumed that it will be quite probable that the survey will raise discussion and thus the school children would quite apparently talk about the questions after the

survey among them, with the teacher or with their parents. Even if not participation the lesson these discussions would quite probably affect their answers in the post-lesson survey.

The effect of the school education campaign was evaluated based on a short survey directed to school children before the lesson (the base level) and about 2–3 month after the lesson (post-lesson). The survey measured three variables: the level of knowledge related to railway trespassing, the reported crossings behaviour of the school children and the school children's assessment of the safety related to crossing the railway lines. The questions were linked to three locations which are shown in **Figure 5.3-2** - **Figure 5.3-4**

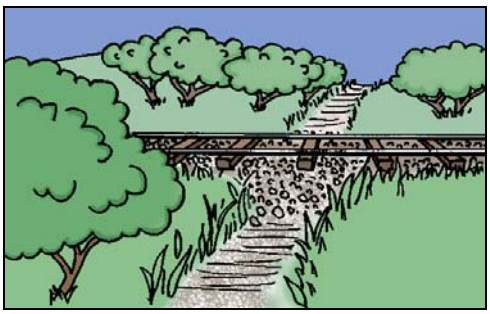

Figure 5.3-2: Picture A: unofficial path across the railway lines.

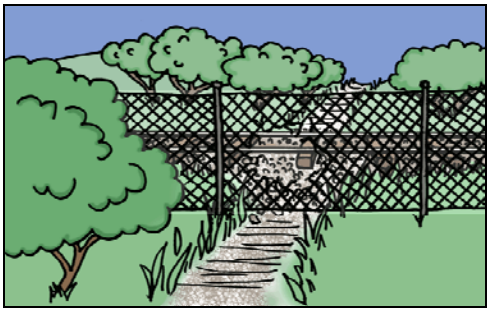

Figure 5.3-3: Picture B: unofficial path across the fenced railway lines.

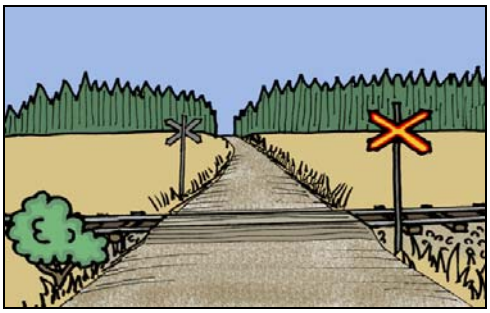

Figure 5.3-4: Picture C: level crossing.

The school children could reply to the short survey anonymously and the answers of the surveys (base line and post-lesson) were not matched afterwards. No individual matching was done since the same students were assumed to collaborate both surveys (unless they were sick). However, the results were matched in class level so that only the answers of classes which participated both surveys were included in the analysis.

5.3.5 Collection of evaluation data

The evaluation data was collected via short surveys (the base line and post-lesson) which were delivered by class teachers based on the instructions written by the researchers. The base level survey was held in the beginning of the lesson and the after lesson survey 2–3 months after the lesson. The teachers were requested to document the number of school children who participated each lesson and the date when the lesson was held.

Moreover, the teachers were requested to answer and fill in an additional feedback form about the lesson which included two questions. The first one was related to the content of the lesson and to any development ideas that the teachers might have concerning the lesson. The second one was related to the opinion of teachers' on how the school children received the message of the lesson to find out the reaction of the school children. The feedback was voluntary but the researchers emphasised that their feedback is very welcome in order to develop the material in the future.

The practices concerning the need of information sheet to be delivered to the parents before the lesson (in order to get their approval) varied among schools. The principals of most schools decided that no information sheet is needed since the survey is short and the surveys combined with lesson can be considered as part of the traffic education given at schools. One principal decided to deliver the information sheets to parents and in this case the information sheet was drafted by VTT.

Evaluation data

In total, 321 school children participated the lesson and filled in the base level survey. Due to unknown reasons the post-lesson survey was not done by all school children who took part in the lesson. Therefore, only the survey results which could be matched at class level will be taken into account in the evaluation. The matched dataset includes 496 answers (248 base level surveys and 248 post-lesson surveys).

In addition to the survey results one filled feedback form was received from one 4th grade teacher.

5.3.6 References

Dragutinovic, N. & Twisk, D. (2006). *The effectiveness of road safety education – A literature review*. R-2006-6- SWOV Institute for Road Safety Research, The Netherlands. Available in Internet: http://www.swov.nl/rapport/r-2006-06.pdf (accessed March 6, 2014).

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Operation Lifesaver. (2014). Rail safety education. http://oli.org/ (accessed March 6, 2014).

Savage, I. (2006). *Does public education improve rail-highway crossing safety?* Accident Analysis and Prevention 38, 310–316.

Twisk, D. A. M., Vlakveld, W. P., Commandeur, J. J. F., Shope, J. T. & Kok, G. (2014*). Five road safety education programmes for young adolescent pedestrians and cyclists: A multi-programme evaluation in a filed setting*. Accident Analysis and Prevention 66, 55–61.

5.4 Pilot test 4: Video enforcement and sound warning

Author: Veli-Pekka Kallberg (VTT)

5.4.1 Description of the measure

Overview

The measure consists of a system that provides a sound warning to trespassers. Persons who are about to cross the railway or have just crossed the tracks are automatically detected by infrared sensor, which triggers a pre-recorded voice message: *Attention! You are illegally in railway area. Leave immediately!* In Kirkkonummi the message was delivered in Finnish and in Tammisaari, where majority of population has Swedish as their native language, the message was in Swedish. The technical components of the measure used in this pilot test were (**Figure 5.4-1**):

- infrared sensor
- 18 W amplifier
- micro-chip with pre-recorded voice message
- loudspeaker
- standard 12 V 60 or 100 Ah battery (providing power to the system).

Figure 5.4-1: Equipment for the provision of sound warnings and collection of evaluation data (excluding 12V battery).

The test equipment included also a camera and recorder for the collection of evaluation data (photos of trespassers). For the collection of evaluation data trespassers were identified by a motion detector built in the recorder, whereas sound warning was triggered by the infrared sensor.

The infrared beam was directed to the footpath used by the trespassers and the sensitivity of the sensor was adjusted to detect pedestrian but not to react to smaller objects like birds. Presence of a pedestrian triggered a sound warning from a loudspeaker a few meters from the path at the height of approximately 3 meters. The equipment was mounted in a utility pole at one test site (**Figure 5.4-2**), and on a rooftop (battery, recorder and amplifier) and wall (infrared sensor, loudspeaker and camera) at the other test site. The volume of the voice message was set so that the message could be clearly heard but did not disturb those living or moving close by.

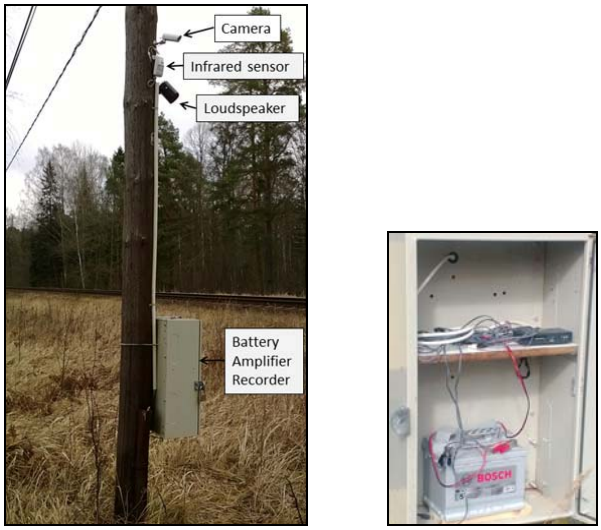

Figure 5.4-2: Pilot test equipment at the Tammisaari site. The camera and recorder are needed only for the collection of evaluation data.

Objectives

The measure is intended to discourage pedestrians from crossing the railway in that particular place, and thereby reduce the exposure of people to collisions with rail vehicles.

Effect mechanism

It is assumed that when trespassers, who are about to cross the railway or have just crossed it, hear a sound message informing them that

- their presence at the railway area has been detected,
- crossing the railway in that particular place is illegal and dangerous,
- they should not cross the railway here, they will avoid trespassing (at least in that particular place) in future.

5.4.2 Previous experiences of similar measures

A literature search revealed two similar applications, where trespassers are given a voice warning, both in the United States:

- Railway bridge in Pittsford, New York (**Figure 5.4-3**) (DaSilva et al., 2006; DaSilva, 2011)
- Illegal footpath in Brunswick, Maine (**Figure 5.4-4**) (Portland Herald Exprees, 2013; Railway Track & Structure, 2013; Bangor Daily News, 2014).

Figure 5.4-3: Trespasser on railway bridge in Pittsford.

Figure 5.4-4: Illegal footpath in Brunswick, Maine.

At Pittsford Bridge, once a trespasser was detected by video cameras, the system sent audible and visual signals to the monitoring workstation at the local security company where an attendant validated the alarm by viewing the live images from the scene. The attendant then issued a real-time warning to the trespasser(s) via pole-mounted speakers near the bridge, called the local police, and then the railroad police, if necessary.

It was estimated that during the three years (2001–2004) of the experiment at Pittsford bridge that the prototype system might have helped save at least five lives from three separate trespassing incidents. In these cases trespassers were driven away from the bridge just minutes before the arrival of the train. It seems likely, however, that the real effect was much smaller because there was enough space on the bridge for the trespassers to avoid collision by stepping aside. Nevertheless, it was concluded that aside from the quite high false alarm rate the results obtained were very favourable in terms of the safety benefits.

In Brunswick the system automatically detects trespassers, captures video with wireless cameras and issues recorded warnings to tell them to get away from the tracks. The systems also can be used to alert local police. This test in Brunswick is a follow-up of the Pittsford project described above. There are no results yet of the effect on the frequency of trespassing or trespassing accidents.

- The main differences between the system tested in the RESTRAIL project and the two U.S. systems were:
- The RESTRAIL pilot test and the Brunswick system both concerned trespassers crossing the railway, at the Pittsford bridge trespassing was along the railway.
- In the RESTRAIL and Brunswick systems the sound warning was pre-recorded, at Pittsford bridge live remote warning was given by security personnel.

- Unlike in the RESTRAIL pilot test, the system in Brunswick and Pittsford bridge can also be used to alert local police.
- There were differences in technical equipment and setup.

The available information about the two previous U.S. installations were not particularly useful in predicting the effect of the Finnish RESTRAIL sound warning system on the frequency of trespassing and related accidents.

5.4.3 Implementation

The measure was implemented at two sites in Finland. The main criteria for the selection of sites were:

- Trespassing is frequent.
- Trespassing is focused in a particular location rather than spread along a wider area.
- There is secure place (e.g. utility pole or building) for the sound warning equipment and devices for the collection of evaluation data.
- Location within reasonable distance from VTT in order to make weekly checks and data collection not too time consuming.

It soon became clear in the initial search of suitable locations that the highest frequency of trespassing in any potential location was closer to a couple of dozens than a hundred per day. After a search and review of potential sites, two sites were selected: Kirkkonummi and Tammisaari in southern Finland (**Figure 5.4-5**).

Figure 5.4-5: Locations of pilot test sites.

Kirkkonummi site

Kirkkonummi is a municipality in southern Finland with a population of 37,000, and the measure was implemented in the outskirts of is centre (**Figure 5.4-6**).

Figure 5.4-6: Location of the Kirkkonummi pilot test site.

In Kirkkonummi trespassers cross the two-track mainline railway especially on their way to a supermarket and back (**Figure 5.4-7**). The number of trains per day is about 120, and the speed of trains is up to 120 km/h. Preliminary surveys prior to the selection of the test site indicated that there could be more than 20 trespassers per day but not likely more than 50.

Figure 5.4-7: Location of the Kirkkonummi site near supermarket. The dotted line shows the footpath and the circle marks the illegal railway crossing. The sound warning device and the equipment for the collection of evaluation data were attached to the end of the building in the lower left corner.

Tammisaari site

Tammisaari is a city in southern Finland with a population of 15,000, and the measure was implemented in the outskirts of is centre. There trespassers use a footpath to cross the single-track railway on their way to a nearby shop and work places and back (**Figure 5.4-8** and **Figure 5.4-9**). The number of scheduled trains per day was 21, and the speed limit of trains was 110 km/h. However, the speed limit was reduced to 50 km/h near the test site so that the actual speed of trains was typically close to 50 km/h, or even less for freight trains approaching uphill from west. Brief observations before the selection of the site indicated that the number of trespassers per day could be about 20–50.

Figure 5.4-8: Location of the Tammisaari pilot test site.

Figure 5.4-9: Footpath at the Tammisaari site, seen from south (left) and northwest (right) of the railway. The red circle shows the location of infrared sensor and loudspeaker.

Sound warning system used in these pilot tests consisted of infrared sensor with adjustable infrared beam, 18W amplifier, microchip with pre-recorded voice message, loudspeaker and 12 V battery. The system was designed and the system components were selected by VTT's engineer who has wide expertise in planning and constructing automatic data collection systems for different kinds of traffic research purposes. The functionality of the system was ascertained in small scale field tests before the actual implementation.

Sound warning equipment was installed in Kirkkonummi 24.9.2013 and in Tammisaari 16.10.2013.

5.4.4 Evaluation method

The planned evaluation of safety effects is based on trespasser counts before and after the implementation of the measure, separately at the two pilot test sites. It is assumed that changes in the frequency of trespassing reflect the effects on the frequency of trespassing accidents. This is a fair assumption since e.g. in road accident studies exposure (expressed for example in kilometres driven) is by far the most important variable explaining the number of accidents. For example, studies in Nordic countries indicate that variation in traffic volume explain about 65–75% of the systematic variation in accident counts (Elvik et al. 2009). Even though the effect of exposure is not necessarily strictly linear, changes in exposure reflect fairly well changes in accident counts.

The planned study design is Poisson or Negative Binomial Regression analysis, where the daily number of trespassers is the dependent variable and the existence of sound warning, location (Kirkkonummi or Tammisaari) and time of year (week or month) are independent variables. Other possible independent variables include the proportion of males (vs females), proportion of adults (vs younger) or other), proportion of trespassers in groups larger than 1 and proportion of in direction away from camera (vs towards camera). However, it is expected that correlations of independent variables (e.g. correlation between sound warning and time of year) will complicate the interpretation of regression models. In that case, a simple before–after comparison of daily numbers of trespassers may be a feasible alternative to regression analysis.

It would have been better if we could have used comparison data to estimate what would have happened to the frequency of trespassing at the test sites in the after-period, if the measure had not been implemented. However, it was practically impossible to find valid comparison data because the development of trespassing frequency in time can vary between sites. The routes pedestrians use daily can change for reasons other than safety measures, and the changes can vary between sites. In a small-scale study like ours it was not possible to use control data that would have enabled reliable estimation of what would have been the frequency of trespassing at the test sites if the measure had not been implemented.

We are aware that the study design does not necessarily take into account all factors that may have affected the frequency of trespassing during the study period. Examples of such factors

include e.g. temperature and other weather conditions that may affect pedestrian activity in general but also the choice of routes. Therefore the result should be considered only as a rough indication of the effect of the measure.

The method and evaluation results will be described in detail in RESTRAIL deliverable 5.2.

5.4.5 Collection of evaluation data

The collection of before-data for the evaluation of effects started in Kirkkonummi already 28.5.2013 and in Tammisaari 1.10.2013, and the necessary equipment (camera and the cabinet containing recorder and battery, see **Figure 5.4-1**) were implemented at that time. Trespasser counts for the evaluation were conducted at Kirkkonummi 24 hours per day for 47 days before the installation and for 67 days after. At Tammisaari data collection lasted 15 days before and 54 days after the installation (**Table 5.4-1**).

Table 5.4-1: Data collection periods.

Stage	Kirkkonummi site	Tammisaari site
Trespasser counts before implementation of sound warning	28.5.–21.6.2013 30.8.–23.9.2013	1.–15.10.2013
Implementation of sound warning	24.9.2013	16.10.2013
Trespasser counts after implementation of sound warning	25.9.–6.12.2013	17.10.–16.12.2013
Removal of test equipment	7.12.2013	17.12.2013

The data collection period in Tammisaari in the before-period was shorter than intended because Tammisaari was a replacement for another originally selected site (in the city of Hyvinkää) that had to be rejected in the middle of data collection because of major roadworks that disturbed pedestrian flow at the site. The installation of sound warning in Tammisaari could not be postponed further than mid-November in order to have enough after-period data before onset of winter and snow. Fortunately, first snowfalls came later than usually, and data collection could therefore be continued later than expected.

Both **Figure 5.4-10** and **Figure 5.4-11** show examples of automatically taken photos (triggered by motion detectors) that were used for counting of trespassers.

Figure 5.4-10: Photos from trespasser counts at the Kirkkonummi site.

Figure 5.4-11: Photos from trespasser counts at the Tammisaari site.

When counting trespassers from photos the following details were also observed and saved for evaluation of the effects:

- date and time,
- direction of travel,
- number of trespassers in a group,
- sex,
- age group (child / youngster /adult) and
- if walking a dog / pushing a bicycle or pram / carrying skateboard etc.

Date and time could be read directly from the photo. Direction of travel and size of group were usually easy to determine. Sometimes it was difficult to define the age group or sex. From night-time photos the direction of travel and size of the group could be determined but usually nothing more. Therefore all variables also had a category unknown.

Altogether, 1096 trespassers were observed during the 62 days in the before-period and 1450 trespassers during the 121 days in the after-period. The data will be used in the evaluation of the effect on the frequency of trespassing and described in more detail in task 5.3 and Deliverable 5.2 of the RESTRAIL project.

Because trespassers were detected by motion detector for the collection of evaluation data and by infrared sensor for the triggering of sound warning, system log files of the system for one week in both test sites were checked to make sure that trespassers in the photos were given a sound warning, and whether sound earnings were triggered without presence of trespassers. Although there were a couple of cases where the trespasser was not given a sound warning (in one case trespasser did not enter the beam of infrared sensor, and in another case a bicyclist drove very fast across the beam), this was not a major concern. Furthermore, there were not observed events where the sound warning was triggered without the presence of a trespasser.

During the data collection there were four events when the collection was interrupted for one or more days:

- In Kirkkonummi no observations were made 3.–5.9.2013 because of unknown equipment failure.
- In Kirkkonummi no observations were made 19.–23.9. and 23.–25.11. because of battery failure.

- In Tammisaari no observations were made 12.–18.11 because of breakdown of infrared sensor.

The above mentioned periods were excluded from the evaluation data.

The pilot test was conducted by VTT, with support from Finnish Transport Agency (infrastructure manager), Finnish Transport Safety Agency and local authorities (**Table 5.4-2**)

Table 5.4-2: Involved organisations and their roles.

Organisation	Role
VTT	Search for potential test sites. Implementation of pilot test equipment. Maintenance of equipment and collection of evaluation data. Overall reporting.
Finnish Transport Agency (Infra manager)	Consultation in the selection of pilot test sites Approval of test sites. Granting permission for implementation of pilot test equipment (if installation requires moving within right-of-way)
Finnish Transport Safety Agency	Consultation in the selection of sites.
Municipality of Kirkkonummi	Permission for attaching equipment on the roof of a nearby building (pumping station).

The estimated cost of the sound warning equipment consisting of infrared sensor, amplifier and loudspeaker is not more than 5,000 €. Another important component of the installation costs concerns provision of electric power. It is recommended that mains current is used instead of 12 V batteries that were used in this pilot test, to avoid the costs of battery change at last once a week. The cost of provision of mains current depends on local circumstances, e.g. the distance to the nearest power source.

5.4.6 References

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5.5 Pilot test 5: A combination of measures at Aydin station

Authors: Muhittin Güneş (TCDD) and Metin Seven (TCDD); Duygu Dokanakoglu (INTADER)

5.5.1 Description of the measure

Overview

The population of the Aydin city is 260 thousand, within the structure of the metropolitan municipality (**Figure 5.5-1**). The geographical position of the stations separates the city in the middle. There are schools, hospital, shopping centre and stadium is really close to the Aydin Station. State Hospital is also near the station zone and people from close towns are coming for treatment to hospital.

People who comes with a train or people whom are there for using shopping centre or going to school, are using the 759 meters long path on the railway line between the Station building and the hospital level crossing is used especially by trespassers going to and from the nearby hospital, stadium and shopping centre. This station has been identified as hotspot after the risk evaluation process due to the high number of trespassing and death of pedestrians.

The measures include physical measures preventing access to the railway area and behavioural measures informing the public about the dangers and illegality of trespassing.

Figure 5.5-1: Location of Aydin Station.

Due to Aydın Station is located in the centre, divides the city centre, railway station and the railway line. In order to the largest shopping mall, stadium, and school to be located near the Aydın Station and due to the fact that state hospital is very close to the railway station, many people who come to hospital for treatment.

Especially patients who come with a train or students and other people who use the shopping centre and going to school, are using the 759 meters long path on the railway line between the Station building and the hospital level crossing as trespassers.

This station has been identified as hotspot after the risk evaluation process due to the high number of trespassing and death of pedestrians (see **Figure 5.5-2**).

The measures will be implemented at the Aydın Station found in 130+012 km of İzmir-Denizli Line within Turkish conventional railway line The station is located in the centre of Aydin, and the railway runs across the city centre (see Figure **Figure 5.5-3**).

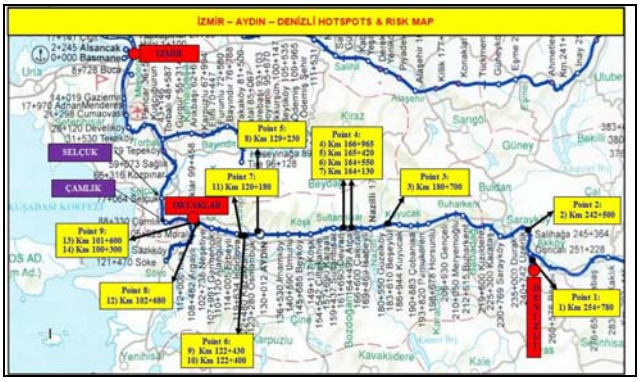

Figure 5.5-2: Aydin Station risk map.

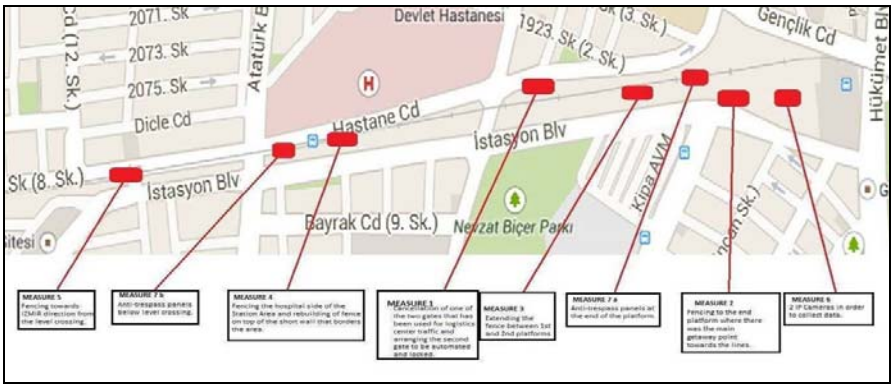

Figure 5.5-3: Locations of technical measures implemented at Aydin station.

All preventing measures installed in the Aydin Station are described in **Table 2.1-1.**

Table 5.5-1: Descriptions of all measures implemented at Aydin station.

Title of measure		Description
1	Cancellation of one of the two gates that has been used for logistics center and arranging the second gate to be automated and locked.	There were two spots logistics centre used one has been cancelled by building a 10 meters of wall and the other gate is made into automated gate door. 4 meters fencing is made in addition
2	Fencing to the end platform where there was the main getaway point towards the lines.	11 meters of fence has been built
3	Extending the fence between 1st and 2nd platforms	120 meters of fence extension
4	Fencing the hospital side of the Station Area and rebuilding of fence on top of the short wall that borders the area.	384 meters of fencing +60 meters
5	Fencing towards IZMIR direction from the level crossing.	180 meters of fencing
6	2 IP Cameras in order to collect data.	2 cameras are placed as one at the level crossing and the other at the end of the platform
7	Anti-trespass panels below level crossing and at the end of the platform.	30 square meters at the level crossing 21 square meters at the end of the platform.
8	Warning Signs And Posters	Non-technical preacaution is taken in several spots for directing to safe paths. Approximately 4 different styles of warning sign at related areas and in total 50 sticker signs which are at the ground directing to hospital and city centre.
9	Leaflets	5000 pcs has been printed out and distributed to local citizens and passengers. These leaflets are describing the safe ways via a small map and also indicating the measures that are taken in respect of correct direction.

Objectives

The measures are meant to affect the behaviour of individuals living close to the stations but also for the ones using this station for their journey. These measures will address to the whole population living in this area as there are schools, a stadium, a hospital and a shopping center around Aydın Station.

Effect mechanism

The effect mechanisms of the combination of measures:

- Measure 1: One of the most people flow is seen at the gates which are frequently used by logistics center thus this measure will almost cut this passway.
- Measure 2:The most of the flow is this area where passengers arrive at the platform and continue walking towards the end of the platform and than pass to the railway lines this measure will reduce this significantly.
- Measure 3: This measure effect will be to avoid passing between platforms.
- Measure 4:This measure is made to avoid pass that has been made between hospital and station.
- Measure 5: This measure is avoiding pass from other local high density areas and diverts passengers to the walking path.
- Measure 6: Cameras also has an effect as per safety and security perspective.
- Measure 7: Antitrespass panels make walking in treated areas uncomfortable. Therefore people avoid walking on them.
- Via technical precautions taken (anti-trespass and fencing), railway Company will be regarded as a reliable firm paying attention to people's and passengers` security of life.
- Measure 8 and 9: The illegal pass of the pedestrians in the future will be prevented via the perception of warning signs and posters, This will help the pedestrians realize that their illegal transition through the railway lines is hazardous. Leaflets will spread the idea of safety concept which is taken into account by the authorities including Railway Company.

In addition, it is expected that the different measures work together so that the effect of each measure in this combination is greater than it would be if implemented alone.

5.5.2 Previous experiences of similar measures

It is not known whether similar combinations of measures against trespassing in railway area have been implemented before in TCDD. Nor are there results on the frequency of trespassing or trespassing accidents of such approaches.

5.5.3 Implementation

Technical and non-technical precautions planned to be taken will be identified by the TCDD and they will be based on the rules of Turkish and European Standards. This kind of preventive measured will be handled not only for the individuals living close to the stations but also for the ones using this station for their journey. These precautions will address to the whole population living in this area as there are schools, a stadium, a hospital and a shopping center around Aydın Station.

Application of measures was planned according the implementation plan collected in **Table 5.5-2**. In the period before that date, precautions will be taken to review without camera records but after the review the camera records will be used.

Table 5.5-2: Overview of the implementation of different measures.

1	Cancellation of one of the two gates that has been used for logistics centre and arranging the second gate to be automated and locked.	This measure has been implemented in 3 phases. First we cancelled the gate which was not necessary and built the second gate with a locked mechanism later the automated system was done.	Dec.2013
2	Fencing to the end platform where there was the main getaway point towards the lines.	For all of the fencing work 18 manufacturers have been found and the most suitable one is chosen after tender process. The related company is than instructed regarding important spots.	Dec.2013
3	Extending the fence between 1st and 2nd platforms		
4	Fencing the hospital side of the Station Area and rebuilding of fence on top of the short wall that borders the area.		
5	Fencing towards IZMIR direction from the level crossing.		
6	2 IP Cameras in order to collect data.	Softwares and necessary server has been setup.	July.2013
7	Anti-trespass panels below level crossing and at the end of the platform.		Apr.2014
8	Warning Signs And Posters	After proper site inspection the locations and scope has been defined.	May.2014
9	Leaflets		May.2014

The plan details of application of technical and non-technical measures is that inside of the railway area has been recorded since 2 camera systems were installed in July, 2013. However, as it was public holiday at schools in July and in August, and as there was no activity at the stadium in these months, it has been decided that the trespassing identified throughout the record analysis did not reflect the reality. Nevertheless, recording and the analysis processes are still being continued. After September, the actual results of the camera records have been identified. Aydın Station Area is archaeological site according to Turkish laws.

Figure 5.5-4: Measure 1: Cancelling of the other gate.

As the controlling and locking of the gate used by the Logistical center, cancelling of the other gate and installing the fencing on the risky spots of the railway area can be fulfilled according to the tender which should be done based on Turkish laws, the process of preparation of the technical contract necessary for the project and other tender document and procedures has been completed (**Figure 5.5-4**).

As additional technical precautions in Aydın Station Railway area, the first anti-trespass panels of TCDD will be applied. For this project, risky spots within this railway area for the pedestrians have been identified based on the analysis done in August 2013, and necessary measures for the construction have been calculated. The necessary research for the pilot application of these panels was started within the European Producing Companies. It is planned that the construction of these panels in Aydın Station area will be completed.

First, it was decided where anti-trespass panels are placed:

- First Point: The end of first platform of Aydın Station Building (**Figure 5.5-5**):
- Second Point: Near Level Crossing (Hospital Level) (**Figure 5.5-6**)

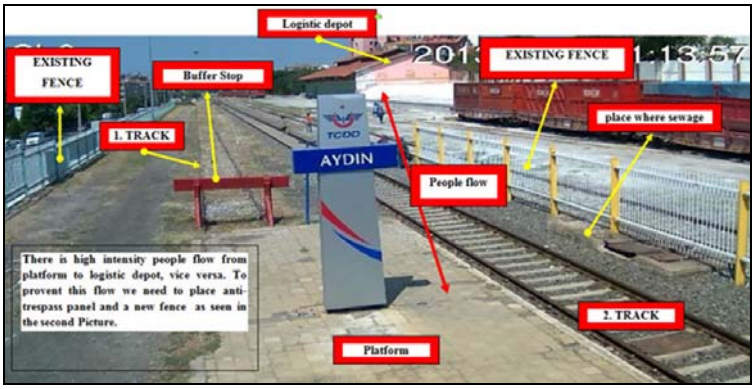

Figure 5.5-5: Measure 7: Installation of anti-trespass panels in the first point.

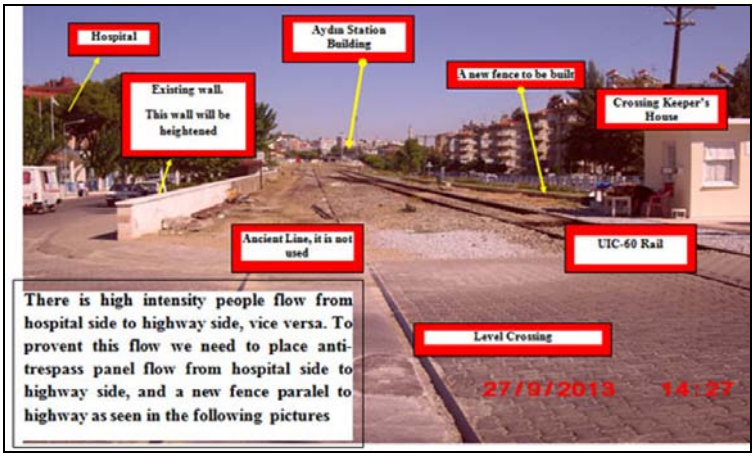

Figure 5.5-6 Measure 7: Installation of anti-trespass panels in the second point.

Figure 5.5-7 shows anti-trespass panels before and after intervention at Aydin station.

Figure 5.5-7 Measure 7: Before/after Anti-trespass panels.

Warning signs and posters for the guidance of the pedestrians and for the prevention of trespassing will be designed and installed end of April, 2014, and the distribution of the leaflets to the passengers on certain days at Aydın Train Station is planned to be done end of April, 2014.

In addition these measures, the materials used for all technical and non-technical precautions will be provided by the TCDD.

Lesson Learned

Planned technical and non-technical precautions (1) cancelling the gate used by logistical centre and controlling the other gate or keeping it locked (2) installing and manufacturing warning signs and posters (3) distributing leaflets to the passengers at the station on certain days. These precautions are not complicated because they are done local opportunity.

However, stage of manufacturing fencing can be difficulty in hot spots whether or not the scope of the project so, audit and control should be done during the manufacturing of fencing.

TCDD will be make application of anti-trespass panels the first time in Aydin Station. Therefore, technical team of TCDD to be continued research related to anti-trespass panels.

Cost of the measure for fence:

1) To re-arrange the first gate which is located in the logistics center for vehicle pass with controlling and locking
2) Cancellation of the other gate which was built (with app. 4 meters fence or concrete wall) for vehicles to pass for logistics centre in the station area

3) To build a new fence with a locked door at the end of the platform of Aydın Station Building to prevent passengers to trespass (with approximately 11 meters)
4) To extend the existing fence which separates two platforms from each other, for approximately 120 meters (**Figure 5.5-8**).
5) For protection of the railway, building a complete fence to the right side from the level crossing starts with hospital through Aydin Station, for app. 384 meters
6) At the level crossing with hospital, the level of the short concrete fence is going to be heightened by adding a fence on it for approximately 60 meters
7) Building a 180 meters long fence from level crossing through the opposite side of Aydin station through İzmir direction.

Thus, the total fence length is 759 meters.

Figure 5.5-8: Measures 2 and 3: Before/after Fencing.

Table 5.5-3 collects the total cost associated to each of the preventing measures installed at the Aydin station.

Table 5.5-3: Cost of the actions involved in measures.

No	Description	**Cost**
1	Measures 2,3,4,5: All fencing work	**32.942,96 €**
2	Measure 1: For supply of electrics to the gate	**786,67 €**
3	Measure 6: IP camera set up to the peron	**666,33 €**
4	Measure 6: IP Camera to the logistics entrance gate	**726,67 €**
5	Measure 1: Automation of the gate	**908,33 €**
6	Lighting for the logistics area	**916,74 €**
7	Measures 2,3,4,5: Additional fencing	**1.938,98 €**
8	Measure 6: Camera link setup	**119,97 €**
9	Measure 6: Camera link setup	**116,67 €**
10	Measure 8: Initial warning signs overall	**333,15 €**
11	Measure 8: Initial warning signs 1st peron	**333,15 €**
12	Measure 7: Anti-trespass	**16.588,00 €**
13	Measure 8,9: Warning signs and leaflets	**1.333,33 €**
Total estimated cost 57.710,96 EUR		

Lastly, the **Table 5.5-4** indicates the roles playing the main organisations in this project.

Table 5.5-4: Involved organisations and their roles.

Organisation	Role
TCDD	Throughout the application process, the production of the materials, their maintenance, their change, and installations will be fulfilled by TCDD.
INTADER	To make consultation and coordination

5.5.4 Evaluation method

After and before of demonstration, by using the camera recordings, the analysis of the trespassing is done and evaluations will be made based on these data. The intended method for the evaluation of the effect on the frequency of trespassing is a before-after study (without comparison data) based on field observations. In addition, throughout the application process, the production of the materials, their maintenance, their change, and installations will be fulfilled by TCDD.

5.5.5 Collection of evaluation data

The effect of the measures on the frequency of trespassing is evaluated. The variables collected include number of trespassers per day, time of trespassing, gender of trespassers, approximate age of trespassers (children: 12 years of younger; youngsters: 12–20 years; adults and elderly people: over 20 years), group size, and If trespassers were carrying or having something with them and the increase of awareness towards the illegality and danger of certain behaviours observed in the railways. Data are evaluated for random periods taking into account public holidays and special occasions. The evaluation data consists of measurements of the frequency of (different kinds of) trespassing before and after the implementation. Trespasser counts are conducted using video camera at specific location where most of the flow can be observed (**Figure 5.5-9**).

Figure 5.5-9: Snapshot of the camera used for evaluation in Aydin Station.

5.6 Pilot test 6: Mid-platform fencing

Author: Brendan Ryan (University of Nottingham)

5.6.1 Description of the measure

Overview

Mid-platform fencing (fencing along the centre line of island platforms) prevents access to fast lines where trains are not scheduled to stop. An example of mid-platform fencing is shown in the photograph in **Figure 5.6-1**(left). There are situations where passengers will need access to trains on the fast lines (to get on / off trains at peak times or for unscheduled stops), therefore it is necessary to include lockable gates along the length of the platform, in the design of the fence. An example of a sliding gate is shown in **Figure 5.6-1** (right).

This type of fencing has been implemented at a number of stations in GB by Network Rail. This field test focused on three pilot areas in GB around London (**Figure 5.6-2**), including more than 50 stations.

Figure 5.6-1: Mid-platform fencing that has been installed at one of our trial stations (left). A sliding gate in the fencing to allow access to the platform when necessary (right).

Figure 5.6-2: Locations of the three pilot test areas.

Based on data in GB, approximately 40% of suicide events occur at stations (equating to around 100 of the railway suicide events per year in GB). Analysis of data on one of the routes in GB (LNW) has indicated that approximately half of the incidents at stations on this route occur on the fast platforms. Therefore, it is possible that this type of intervention could target the prevention of around 50 incidents, on the basis of these national data. However, this should be regarded as a preliminary estimate of the numbers of incidents that this intervention could target as there are a number of factors that influence the numbers of incidents that occur at stations in different geographical locations and the performance of this measure (e.g. different station layouts, other

points of access to the railway in a particular area). Our preliminary analysis suggests that the numbers of incidents at stations in our pilot study locations are much higher than the national average, as there are few if any railway crossings or other access points.

Objectives

The measure presents a physical barrier to prevent access to fast lines at targeted stations. It does not prevent access to slower lines. The measure therefore only targeted those who choose fast lines and non-stopping trains for the purpose of suicide. Whilst this measure primarily focused on the prevention of suicide, it was anticipated that the fencing would also have some potential preventative effect on some types of trespassing or accidental injury at stations. Some commentary on this is provided.

Effect mechanism

The measure physically restricts access to the track. The fencing is 1.4 metres in height and therefore not too difficult to climb, but it exerts its effect by making it harder for people to approach the edge of the platform. Any person who is on the other side of the fence would also be more identifiable to staff or passengers at the station. The fencing could also give a greater sense of safety to passengers who are waiting on the adjoining platform when a very fast train passes by. This is not a permanent, continuous barrier by reason of the fact that there are gates for access in various circumstances.

5.6.2 Previous experiences of similar measures

We have not found any reports in the literature that considers this type of preventative measure specifically (i.e. mid-platform fencing). However, many publications refer to the potential effectiveness of restricting the means of access to a method of suicide, covering means restriction in general (e.g. Beautrais, 2007; Yip et al, 2012), or more specifically, relating to inhibiting access to the track in a railway context, predominantly through fencing or barriers (e.g. Cox et al, 2013; Daigle, 2005; Mishara, 2007). For example, Cox et al (2013) conduct a review of nine studies on the effectiveness of restricting access to lethal means by installing physical barriers.

Fencing can be applied in various locations on the railway as a physical barrier, including at platform ends (RSSB, 2005a, 2005b), as platform screen doors to limit access to the track at subway stations (Law et al, 2009), fencing in the first third of station platforms where trains enter platforms at higher speeds (Clarke and Lester, 1989, Clarke and Poyner, 1994), as well as at various locations on the open line or near to crossings, bridges or other higher risk locations. Clarke and Poyner (1994) have also recommended the need for steps to separate non-stop trains from platforms where passengers have access. Fencing could also have another mode of operation, acting as a psychological deterrent to access a place of risk (Rådbo, Svedung, & Andersson, 2008; van Houwelingen, 2011).

The literature includes reports on the use of fencing or physical barriers in other locations (e.g. to prevent jumps at bridges). Fencing and nets at bridges at many sites around the world is reported to have reduced the risk of jumping accidents (with increases if fences are removed) and there is evidence to suggest that there is minimal risk of people going to other locations (Beautrais, 2007; Cox et al, 2013; National Institute for Mental Health in England, 2006; Reisch and Michel, 2005).

Therefore, fencing can be effective in making access to the railway harder for people who are at risk of suicide on the railway. Suicide on the railway is often thought to be impulsive and not necessarily of a longstanding nature, so an intervention which makes access harder may be sufficient to prevent an incident at the time at which people are contemplating suicide. There are various examples of the application of fencing in the literature and a small number of evaluation studies.

Use of fencing is not straightforward and without some problems to overcome. It has been suggested that the cost of fencing is high (Kerhof, 2003). Fencing is usually of a permanent nature, though locations of railway suicide are often thought to be transient (SOVRN, Abbot et al, 2003). There are examples of where the whole of the railway is secured (track and stations in high speed rail, some underground systems). However, more usual practice is to provide fencing at places of greatest risk (hotspots) (Ladwig et al, 2009; Erazo et al, 2004a). Fencing has sometimes between criticised on grounds of aesthetics (Beautrais, 2007). Some have said that fences need to be very high to be effective (e.g. six to nine feet, Berman et al, 1990). However, this may not be the case in all circumstances. There are thought to be other ways in which a fence or barrier may inhibit access to the railway (e.g. symbolic barriers – indicating a limitation of performance of an action, but which might be disregarded by the individual, Hollnagel, 2004).

5.6.3 Implementation

This measure has been implemented by Network Rail on their own initiative (irrespective of the RESTRAIL project). However, Network Rail has granted access for research / evaluation purposes to staff involved in the programme (for their knowledge and expertise) and to data regarding implementation issues.

These three pilot trial areas in RESTRAIL include 52 stations, as illustrated in **Table 5.6-1**, Mid-platform fencing cannot be used in all locations at which it is desirable, for a variety of reasons. This type of fencing has been, or is in the process of being designed and fitted, at 25 of these stations as part of the current programme of work at Network Rail. Access to the fast lines has previously been restricted at a number of the stations in the pilot test areas. There are 14 locations where the fast lines are not directly accessible from a platform, either because of a pre-existing fence or because of the configuration of the station (these include 3 stations in which more permanent fencing will be fitted as part of the programme).

Table 5.6-1: Summary of the mid-platform fencing work at the 3 trial locations.

Route (number of stations in the pilot test area)	Numbers of stations with the mid platform fencing intervention
Western (20 stations)	Fencing work has been completed at 11 stations. Permission for fencing was not granted at 2 stations that were in the initial programme and alternative arrangements to prevent incidents have been required. Access to fast lines is already restricted at 3 additional stations by other fencing.
London North West (24 stations)	Fencing work has been completed in 4 locations, partially completed in one station and at the design stage in three stations (2 of these have some temporary, partial fencing already). Access is already restricted by existing fencing, or there are no platforms directly facing fast lines at 11 stations (including the 2 above where some partial fencing exists).
Sussex (8 stations)	Fencing work has been completed in 6 locations (2 completed in 2008, 4 completed in 2012)

There are some differences in the types of fencing at a number of the stations. For example, at one of the stations, temporary measures were provided in the period leading up to the London Olympics, because of anticipated increases in passenger numbers (see **Figure 5.6-3**, left). In some cases, other types of fencing were in situ, prior to the current fatality mitigation projects. **Figure 5.6-3** (right) shows an example of fencing that has been fitted to inhibit trips on platforms

where there are slightly different platform floor surface levels (i.e. the fencing has not been provided with the intention of stopping people from accessing the fast lines).

Figure 5.6-3: Example of some temporary fencing that is obstructing access to the fast line platform (left). Examples of two types of fencing that were provided for reasons other than fatality prevention (right).

The programme of work at Network Rail has also included the implementation of additional restrictions to access to fast lines at the stations in the pilot test areas. This has included the provision of barriers or locking of gates to footbridges or underpasses to some fast line platforms which are used infrequently. In some cases this type of intervention was carried out many years ago. On one of the routes for the pilot tests this additional intervention has been carried out in conjunction with the mid-platform fencing work. An example is shown in **Figure 5.6-4**.

Figure 5.6-4: Restriction of access at other fast line platforms

5.6.4 Evaluation method

The evaluation focused on the collection and analysis of three types of data:

- Statistical data on incidents;
- Descriptive data on stations and the details (dates and types) of different fencing interventions (including descriptive data on the process of implementing the intervention);
- Information from interviews and observational data from detailed station visits.

The evaluation considers the potential effectiveness of the mid-platform fencing intervention in preventing access to fast lines (i.e. outcome measurement, to consider whether there is a

reduction in numbers of incidents at locations where fencing is provided). It is difficult to control external factors in this type of field study and therefore proof of causality has not been a target of the evaluation. Descriptive information has been collected to determine where events have taken place in relation to fencing. A theory based approach (Hills and Junge, 2010; HM Treasury, 2011) has also been used to understand whether the intervention has worked, why it has worked and under what circumstances it has worked.

It was anticipated that it might be difficult to demonstrate significant changes in the numbers of fatalities over the course of the monitoring period, because of the small numbers and variability in the incidents at any particular location. The evaluation method was therefore designed to overcome this weakness in two ways:

- Looking at historical data to examine the numbers of incidents at locations at which access to fast lines has been restricted for a longer period of time (by pre-existing fencing or the configurations of platforms at stations);
- Demonstrating the potential effects of the fencing through other performance measures (e.g. relating to perceptions of impacts on passenger flow), as investigated in interviews with staff in a number of relevant railway roles, such as station managers, senior managers and operational staff at train operating companies. These interviews also collected data to help understanding of the situations in which access is needed at the platforms and working arrangements that are needed to manage access and passenger flow at stations)

The analysis of the statistical data includes various comparisons of the numbers of incidents at specific platforms in stations in the test areas (e.g. comparison incidents at stations where there are restrictions of access to fast line and those where there are no restrictions of access). More detailed statistical analysis included examination of trends in the data by year and investigation of factors affecting the numbers of incidents at stations. These analyses also investigated whether there was any indication of displacement of incidents to lines or stations with no restrictions (from those where there is a restriction in access).

It was not possible (nor desirable) to examine the introduction of mid-platform fencing in isolation from other interventions or circumstances at the trial sites. The fencing was implemented as a programme, which was funded and designed by the industry. Prevention of these types of incidents at the stations is therefore part of a much wider programme of work. As such, other interventions are in progress at most, if not all, of the stations (e.g. prevention work that is carried out by the British Transport Police, work of the Samaritans in training station staff, use of posters and signs, other station infrastructure such as floor guards or markings on platforms). The extent to which these other measures have been implemented at the trial sites has also been investigated as part of the pilot study. The evaluation method was therefore designed to collect data on the other interventions or factors that might impact on the numbers of incidents at the target locations.

The evaluation method was also designed to collect descriptive information on the way in which the intervention has been designed, implemented (i.e. the extent to which the fencing has been implemented at different sites and the process of implementing the mid-platform fencing intervention) and used at stations.

Some questions that have been considered within our evaluation are as follows:

- Does installing mid platform fencing lead to a reduction in suicides on the rail network?
- Does installing mid platform fencing lead to other positive or negative operational impacts on the railway (e.g. a reduction in disruption caused by rail suicides on the rail network; impacts on passenger flows or movements on the platform, passenger satisfaction of the platform

environment)? Are there any intended and unintended outcomes and any unexpected benefits or problems?

- Does the intervention work in relation to specific situations or contexts, or for certain groups of individuals (e.g. age, gender)? Does it work for some rather than others? Does it reach the target group?
- Are there changes in numbers of incidents? If so, can these be attributed to the intervention or are there other factors (including other interventions) that could have influenced the outcomes?
- How has the programme been introduced and implemented in the target locations (e.g. progress with implementation of the programme, variations in levels of implementation)? Has it been implemented as it was intended?
- Which factors contributed to the success (or not) of the programme?
- What obstacles have been identified and how have these been overcome?
- Is there anything that could have been done to improve installation?

Where necessary, additional commentaries and interpretations on issues have been provided, based upon review of literature and other industry reports (e.g. on the use of fencing on stations, stations widths).

Our activities in evaluating the programme did not impact on railway operations. All work that involves people as participants in research activities requires ethical approval from the University / Faculty ethics committee. Therefore, where people are observed or asked questions as part of our research (e.g. staff interviews / surveys), ethical approval was obtained for the research work.

5.6.5 Collection of evaluation data

The data collection exercises were planned to be carried out at different time intervals. Some were carried out at the start of the trial to collect baseline information on incidents, the existing situation at stations and the proposed programme of work. Other data collection exercises were carried out daily / periodically throughout the trial period. A final set of data collection activities were designed to take place towards the end of the trial period, to collect more detailed evidence on relevant topics, to review progress on the implementation of the intervention and to determine the potential success of the intervention.

Table 5.6-2 outlines the roles of various stakeholders in the collection and supply of data or evidence for the evaluation of mid-platform fencing.

Table 5.6-2: Involved organisations and their roles (main responsible organisation first).

Organisation	Role
University of Nottingham	Specify data / information requirements, collect data and information, analyse data and completion of the evaluation
Network Rail	Provide access to data and staff expertise and knowledge on the on-going industry project to implement mid-platform fencing. Responsible for the design and implementation of the mid-platform fencing programme
RSSB	Provide incident data on incidents from SMIS, the industry safety management information system
British Transport Police	Provide access to data on incidents and Suicide Prevention Plans and staff expertise and knowledge on the on-going work to prevent railway suicide. Provision of additional data (from 2009-the present day) for one of our pilot areas on numbers of incidents, locations of incidents and numbers and locations of interventions by police, staff, members of the public.
Train operating companies	Provide access to data and staff expertise and knowledge on fencing and other interventions at stations. Also provision of information on management structures and policies at stations, and data (e.g. on footfall and passenger flow).
Samaritans	Provide access to supplementary data on incidents and expertise on existing preventative measures

Work on the evaluation of the mid-platform fencing was carried out between January 2013 and July 2014. This has involved the following activities in relation to data collection:

- Developing support and contacts for our evaluation of the programme of work (3 routes)
- Requests for information and receipt of background information, including:
  - Statistics and data from incident databases for all suicides in the trial areas (over 20 years of data
  - Station descriptions / plans, including photographs
  - Details of schedules / schemes of work for mid-platform fencing (2 stations in the trial area)
  - Costs of works
  - Train running data
  - Socio-economic / other data re station locations
  - Details of specific incidents in the target area (including PIER plan documents)
- Familiarisation visits to stations, understanding the layouts of stations, requests for additional information on numbers of incidents at stations and discussion of the interventions at stations
- Initial analysis and collation of data from three routes (station descriptions and associated data, from various reports, specialist reports on passenger numbers, month end progress documents, site plans, incident review forms, documents, spreadsheets, emails, informal interviews and site visits). Relevant data have been collated in summary record sheets for each station within the study.

- Analysis of statistical data (numbers of incidents at target locations, dates of incidents, identification of locations of incidents, details of incidents, classification of incidents, factors affecting incidents)
- Discussion of preliminary findings from the analysis with route representatives
- Additional data from BTP databases on the numbers of incidents and interventions at stations on the three pilot areas, including more detailed data on the locations of incidents and factors associated with these incidents.
- Examining and recording details from daily control logs to identify incidents within or near to the trial areas. Requesting additional details from route representatives on incidents that have arisen in the trial areas.
- Receipt of photographs of completed work at stations as the rolling programme of implementation continues
- Interviews with various personnel, using checklists and prompts for questions, based on emerging findings from the analysis of data on incidents and the collation of evidence on the implementation of the fencing initiative.
- Analysis, synthesis and interpretation of all data sources.

A detailed account of the three main data types that have been collected is provided below.

Statistical data on incidents

Relevant data relating to the effectiveness, design and implementation of the programme of mid-platform fencing have been collected from June 2013.

Data on numbers of incidents have been collected for a period of around 20 years (from 1994). These data have been collated according to the following headings:

- Suicide, attempted suicide, accidental fatality – with the main part of the analysis focusing on suicide events
- Location - Station / crossing / open line
- Line – distinguishing fast and slow lines
- Age, sex
- Delay minutes, cost (where available)
- Place of access
- Mode of access – immediate actions, pre-cursors, other description
- Time, Day, Month, Year
- Witnesses
- Mental health / other factors
- Manned hours of station, station manned / unmanned at time of event
- Visibility (daylight, darkness)

Information has been collected on any incidents that occurred in the trial during the course of the year from the start of July 2013. This was to understand the following: if the intervention did not work where it was intended to, ascertaining whether incidents were in a location that was not protected by fencing (such as a slow line) and considering whether there was any evidence that

the incident could have been influenced by the fencing in another area (i.e. displacement). This was to determine if mid-platform fencing (if it could have been fitted), would have prevented the incident.

Descriptive data on stations and the intervention

Descriptive data has been collected to understand the design, implementation and potential effect of the programme, as well as other factors that can impact on the programme. This includes detailed descriptions of the phases of work in the programme of implementation across all of the stations for two of the pilot test areas (for Western and London North West). The work to implement mid-platform fencing in the third pilot area (Sussex) was carried out between 2008 and 2012 (i.e. before the start of this field test). Inclusion of these stations is valuable to this analysis as it is over 5 years since the fitting of the fencing at two of the stations and almost two years since fences were erected at 4 of the stations on this route. Summary evidence on the programme of fencing on the Sussex route has also been collected from programme staff.

Data has been collected from stations within the pilot test areas where no fencing intervention has been applied. This has collected comparable data on incidents at these locations, as well as helped to understand more about the type of circumstances in which this type of intervention may or may not be appropriate.

Information has been collected on the range of preventative measures that are used at stations in the trial area. This has provided the descriptive, contextual information that can be used as a means of understanding how different measures might interact with the main intervention within the study (e.g. determining the potential confounding effects of other programmes or interventions, such as posters and signs, CCTV, station infrastructure, station presence, access to platforms). A detailed description of the implementation of mid-platform fencing and the factors affecting the success of the implementation is therefore an important output from our work. This includes details of planning consents, getting agreement from all parties, design considerations and working around existing infrastructure, scheduling work, access to stations and supply of materials, working practices, practical difficulties affecting the implementation, timing of work / timescales. Descriptive accounts have been produced of the circumstances in which fencing has been provided and the circumstances in which different operating practices may be needed.

Tables and diagrams have been produced to summarise the different stages and timings of the intervention. Contents of these summary tables and diagrams help to inform the discussion of findings and contribute to general conclusions on the evaluation questions and the identification of lessons learned across all stations. Recommendations and guidelines for implementation of the fencing intervention have been produced.

Descriptive data for each station in the pilot areas has been summarised according to the following headings:

- Figure - plan of station
- Incident history (dates, locations / lines, refer to descriptive details of incidents where available)
- Preventative measures – fencing (including mid-platform fencing, (dates of implementation), Other fencing / prevention of access (date), legal aspects, planning aspects, safety / passenger movement)
- Preventative measures – other
- Platforms / lines

- Train services
- Station characteristics / station operation (staffing, opening times, management, platform widths, other programmes and influences, other operational aspects)
- Local area / socioeconomic details – only limited descriptive data will be provided, where these are available
- Costs
- General conclusions - based on what has been learned from looking at this station.

Network Rail has been consulted and is supporting the collection of cost data for elements of the programme, including a worked example of how the business case would be considered for this type of work.

Information from interviews and observational data from detailed station visits

More detailed descriptive content on implementation of the measure has been collected during interviews with programme staff and staff from two or three of the stations (for each of these routes). These interviews have been carried out with staff from Network Rail, relevant train operating companies and other stakeholders, to discuss the potential impacts of the programme, including the following topics:

- Overview, perceptions of the programme
- Feedback on preliminary analysis of data (incidents and station evidence)
- Rationale for some programme decisions (e.g. platforms that will not be protected)
- Factors affecting the implementation, such as known delays in the programme (e.g. access programmes, planning restrictions, delays in completion of work, practical issues)
- Passenger movements before and after fencing interventions; passenger safety
- Costs

The interviews gave an opportunity to discuss issues that were identified in other analysis of the incident data, from our review of available company documentation on the progress of the fencing intervention programme, and from our regular contact with the programme managers of the programmes (e.g. where the fencing intervention may potentially introduce problems relating to footfall and passenger flow on narrower platforms).

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5.7 Pilot test 7: Societal collaboration to prevent railway suicide

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5.7.1 Description of the measure

Overview

This measure is collaboration between 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 both of the person at risk, but also the safety for the police, rescue services and ambulance, the parties responsible for conducting search and rescue.

Involved parties in this collaboration are the Emergency call centre (112), the Police authority, the Ambulance serviced, the Rescue services, the Psychiatric care centre and the National transport administration. These stakeholders cooperate and act together to stop suicide attempts, when someone is acting to take their life outdoors anywhere in the region. Since the cooperation involves all threats of suicide, it may also be jumping from bridges, threat of drowning, jumping from high buildings etc. Two central Swedish laws support this proactive way of work, one supporting the police department and the other one the rescue services. These two organisations are usually the ones to take the first initiative of the collaborative work in an acute situation. The psychiatric care centre is also an important stakeholder and every “saved” “rescued” person is submitted to them.

The initiative for the collaboration in Skåne was initiated by the police and started as a joint project in 2009. It was enforced in practice by September 2012. The involved stakeholders agree that this is a good way to work to prevent accidents, and the “project way of working” is now established.

Objectives

The purpose of the measure is to create good circumstances for a proactive societal collaboration when there is a threat of suicide, and thereby reduce the number of railway suicides and injuries resulting from suicide attempts.

Effect mechanism

It is expected that the piloted collaboration measure will prevent railway suicides by:

- adapting train traffic to prevent collisions
- enabling the search and rescue teams to remove potentially suicidal persons from track area and providing the teams the safe circumstances to work in the track area
- providing professional help to suicidal persons that have been rescued from the track area
- someone else than the suicidal person reacts to prevent an accident in the society

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).

There are a number of different ways in which the stakeholders can be made aware of an unauthorized person in tracks. It can be a phone call about a suicide threat to 112, the police or rescue services, but the alarm can also be triggered by the cameras in the City tunnel in Malmö. Similarly, a train driver can alert the signal control centre (Transport administration), if they see someone in the wrong place. This way, the railway traffic is alerted and acts to prevent accidents. If the exact location is known the traffic is stopped, but if not, there will be a speed reduction for all trains until the person is found or the area is declared safe.

In the Malmö City tunnel there is about 180 cameras with motion detection, ten of those are to detect trespass in the tunnel portals. The other cameras are on the platforms (in three stations) and inside the tunnel itself.

The Transport administration also manages 10 to 15 cameras at the joint train/bus/ferry station in Helsingborg.

In the city of Lund and the line between Malmö and Lockarp (south from Malmö) there is another 37 cameras with the main purpose to detect trespass (vandalism, theft and suicide). None of these cameras are placed on a platform and is for surveillance purposes.

5.7.2 Previous experiences of similar measures

This project is based on experiences from another Swedish region, Jönköping, where the stakeholders began to work together when there was a threat of suicide ten years ago, 2004. Their work shows how different stakeholders should and can act on threats of suicide (Wibble et al., 2005). A number of Swedish laws support this proactive way of work. Based on the experiences from the stakeholders in Jönköping, this way of cooperation and acting together has been spread to other regions, including Region Skåne, the host of our field test.

5.7.3 Implementation

Skåne County consists of 33 municipalities, with about 1.2 million inhabitants, 13 percent of the population in Sweden (**Figure 5.7-1**). Skåne County have elements that are both densely populated with high frequency of train services but also less populated areas. Malmoe is the largest town in Skåne and the third largest town in Sweden, with two of the major rail lines connecting Sweden to the European continent.

Figure 5.7-1: Skåne County in southern part of Sweden – Implementation site.

The collaboration measure described here was first implemented in September 2012 and has been active since then.

The participants in the collaboration and their responsibilities are:

- The Police Authority, always alerted to a threat of suicide, and according to Swedish law have the right to act to prevent danger of fatal injury.
- The Rescue service (fire brigade), provided by municipalities and organized in different unions and smaller operations, divided into 32 units in Skåne. These 32 units organized themselves in RÄDSAM Skåne to work in the same manner. The Swedish Civil Contingencies Agency (MSB), promotes and develops national guidelines. The governing law for the rescue services commits them to act to prevent accidents in the municipalities.
- The emergency call centre (112) is the organization that often first receives an alarm and then alerts all the other parties, according to a newly adapted emergency plan (for suicide threats).
- The signal control centre (managed by the Transport administration) is alerted to introduce a temporary stop of the traffic or a speed reduction on the identified site and then supports the other stakeholders in their work
- The ambulance service is dispatched to help with transportation and medical expertise
- The Psychiatric care centre are informed of the threat of suicide and are prepared to receive the suicidal person

Costs

In the current pilot project the cooperation is based on the regular tasks of the involved authorities. There is a small cost for meetings to coordinate the work (approximately 4320 EUR/year).

Lessons learned

The participants in this field test underline the importance of a possibility for the involved stakeholders to meet and discuss, not only the project itself, but also views and ideas from the personnel who are involved in the rescues. The meetings are basically to make the implementation and the actual collaboration run smoothly. In these meetings deviations is an important matter. For example if not all have been accounted for when the traffic starts again. It is also important to communicate the purpose and the reason why the collaboration was started.

5.7.4 Evaluation method

The approach to the type of suicide prevention put in action by the collaboration in Skåne is supported by scientific research and that is one of the reasons why this measure was chosen to be a pilot test. In Rådbo (2012) five different summary themes was presented that sorts the different types of actions based on the suicidal process (Beskow et al., 1994). One of these themes is that someone other than the suicidal person reacts and acts on the fact that a person is in the wrong location. Society is seen as a protective barrier and work to protect a person who deliberately chooses to harm themselves. Behind this argument you can find other psychiatric research describing suicidal persons/people in crisis/chaos and their acting in a spur of the moment (Nixon et al., 1985). This can be summarized as the suicidal person is suffering from a mental accident. Trying to prevent the actions of a suicidal person is very important, most people who are saved choose to live on and do not make a new suicide attempt (Beskow et al., 2005).

In the evaluation of the measure following methods were used:

- Qualitative interviews with stakeholders
- Quantitative analysis of relevant events in the targeted rail network from June 1 to December 31 2013

Eight interviews have been conducted. Among those interviewed 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).

All registered events in the Transport administrations 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.

5.7.5 Collection of evaluation data

Collection of the results of interviews

The results of the completed interviews was coded, categorized, and have been consolidated into three central themes. The themes are collaboration, communication and traffic stop.

The participants were asked to participate in interviews at one of the groups meetings. Later, contact was made by email when they could then decide day and time for their interview. The interviews were made by phone. Those who did not reply with a preferred time were not interviewed. Nevertheless the interviews have given a good picture of the cooperation. A summary where the results of all interviews is condensed into categories, were distributed and validated and accepted by the interviewed group.

Collection of the quantitative results

The data sets that have been collected are developed based on existing documentation of the Swedish Transport Administration and their IT application Synergy, but also a data compilation from the police. Variables are then compiled into the program SPSS to more easily perform analysis based on all the data. Based on police data, we have information about how long the traffic stop lasted and if the person was taken into custody or not. Data were collected on 64 "threats of suicide" with respect to when and where people have made the trespass, how they acted, the number of traffic stops, the number of persons taken into custody and the impact of delays in train services.

Some caution should be taken when interpreting the results since the number of reports is relatively small to make a quantitative assessment from. Specific statistical calculations have not been made. Despite a limited data set comparisons can be made based on other scientific studies and the results should also be considered as information that shows potential and valuable details to bring out effective measures for suicide prevention.

The 185 events that occurred in June -December 2013 have been sorted based on the following variables:

- Incident
- Threat of suicide
- Suicide
- Not describe
- Killed by accident
- Suicide attempt, inured

Of these variables, 64 “Threats of suicide” will be expressed more in detail. Threat of suicide are the cases where it is explicitly mentioned that it is a suicidal person in the track area or someone that have threatened to take his life (alarmed by themselves or someone else who reported to the emergency call centre).

Discussion

Interviewing and collecting data about past events has been a method to gain more knowledge about how the collaboration works. However, all parties involved in the consortium have not accepted to be interviewed. Therefore, only one interview within the Train control centre have been possible. This may have limited the complete picture of the traffic control/train management, even though others within the National transport administration were interviewed.

Based on quantitative data, a good background has emerged and it is possible to compare these results with other research. The pattern of when, where and how the events occur is consistent with the behaviour of the suicidal person at the starting point. This study has also included data showing the number of traffic stops and how much they have affected the traffic. Data was obtained from the Transport administration incident and accident database. Other data on how the traffic was affected have not been included, which can be seen as a shortcoming in this study.

Conclusion

It is important that:

- There is a continuous work to create engagement and knowledge of the purpose for this collaboration - to save lives.
- There is a good communication between all involved parties both at the site but also to understand each other's working methods, powers, similarities and differences.
- Regular meetings to discuss events and manage deviations and common risks, especially the risk of acting in the railway environment.

5.7.6 References

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

5.8 Pilot test 8: Gatekeeper Programme - Germany

Authors: Karoline Lukaschek and Karl-Heinz Ladwig (HMGU)

5.8.1 Description of the measure

Overview

What: Educational seminars/training: Gatekeeper training.

Gatekeepers are frontline staff, whose contact with potentially vulnerable subjects provides an opportunity to identify at-risk individuals. Gatekeepers possess 1) knowledge about high risk time windows for railway suicide, 2) awareness of deviant behaviour preceding railway suicide, 3) the courage to show initiative, and 4) the ability to handle people in despair.

How: taught course (outline see **Table 5.8-1**).

Table 5.8-1: Course outline and Programme (4 h).

Module 1	Introduction of teachers, participants, programme and goals. Pre-test
Module 2	Facts and statistics about suicide and railway suicide
Module 3	Deviant Behaviour of railway suicides: Participants were introduced to deviant behaviour preceding railway suicide by using media reports about railway suicides and data from previous research.
Module 4	Contact with persons at risk: Active Listening Participants were introduced to the concept of “active listening”. After that participants worked in four groups on different scenarios. All scenarios described a crisis situation involving subjects in despair. Possible solutions to the situation were given. Participants were asked to discuss the given solutions (appropriate solution, non-appropriate solution) using their active listening skills
15:00 h	Break
Module 5	Group exercise “Active Listening”
Module 6	Railway suicide a traumatic event, Group: cross-talk The effect of railway suicides on witnesses, especially police officers and traindrivers as parties involved, were discussed, using research data and participants’ own experience
Module 7	Final Remarks, suggestions, take away message. Post-test.

Target group: Railway frontline staff and individuals working in a railway environment (e.g. Police Officers, train drivers, security personnel, aid organisations, Samaritans)

Objectives

- Prevention of railway suicides by intervention of staff working in a railway environment when being confronted with apparently suspicious behaviour during their daily routine work.
- Enhancement of staff’s intervention skills when being confronted with apparently suspicious behaviour during their daily routine work.

Effect mechanism

The evaluated effects concern the knowledge about and attitudes towards (railway) suicides of those working in a railway environment. The hypotheses are that after taking the course, participants a) are more aware of deviant behaviour preceding railway suicides b) are better able to recognise subjects with suicidal intention, c) feel more confident to approach and deal with vulnerable or suicidal subjects.

5.8.2 Previous experiences of similar measures

Previous experience with brief gatekeeper training courses showed that a brief suicide prevention Gatekeeper training among US university employees significantly enhanced knowledge from pre- to post-training ($p<0.001$) (Cross, 2010) and that a brief training on suicide prevention among General Hospital personnel significantly improved the attitudes and beliefs towards suicidality (p-values ranging from 0.01 to <0.0001) (Berlim, 2007).

5.8.3 Implementation

The course took place at 15th November 2013. It was performed within the clinical setting of the University Hospital Klinikum rechts der Isar, Department of Psychosomatic Medicine and Psychotherapy, Technische Universität München. The course was headed by Prof. Dr. Ladwig and Dr. K. Lukaschek. On the one hand, the course was based on a teaching approach, on the other hand, participants also had the opportunity to (inter)act during the exercises. One of the main characteristics of the course was to bring together professional groups working in different areas of the railway environment in order to stimulate cross-talks and to share experiences. Members of three organisations that work in a railway environment participated at the course (German Federal Police, German train driver's union GDL, Aid organisation „Bahnhofsmission"). The total number of participant was 12, which was well within the desired range of 10–15 participants. For several obvious reasons, a gatekeeper course that lasts too long is not applicable. Thus, we aimed for a short course (max 4 hours) that has participants listen to the teacher, but also gives them the opportunity to (inter)act. In order to accomplish this, we cannot allow more than 12–15 participants per course.

Regarding the sample profile: We worked under the assumption that participants would benefit from a "multidisciplinary" setting (see above) that enables several occupational groups to share their experiences with railway suicides and railway suicide prevention. Positive Feedback from the participants confirmed our assumption.

5.8.4 Collection of evaluation data

The study was designed as an intervention study. Data were obtained using a predefined questionnaire (an English translation is provided in **Table 5.8-2**). Changes in knowledge about and attitudes towards railway suicide were evaluated between two time points:

Time point 1 (t1): Baseline assessment shortly before the gatekeeper course (N=12)

Time point 2 (t2): Post-intervention assessment immediately after the gatekeeper course (N=12)

Time point 3 (t3): Post-intervention assessment three months after the gatekeeper course. Note: Information at t3 was obtained from 10 participants only (N=10).

Participants were personally asked to fill in the questionnaire at t1 and t2. Data on t3 were obtained via email using the same questionnaire (**Table 5.8-3**). Knowledge about railway suicide (warning signs, prevention, facts, handling of suicidal subjects, referral) is assessed using a VAS (visual analogue scale) ranging from 0 (no knowledge) to 10 (very good knowledge) (see table). Attitudes

towards railway suicides (communication with and support of suicidal subjects) are assessed using a Likert-scale with three ordered response levels to every item ("not very likely", "somewhat likely", or "highly likely") which were coded as "1", "2", or "3".

Table 5.8-2: English translation of the German questionnaire that was used at three timepoints (baseline, immediately after the intervention, three months after the intervention) to assess participants' knowledge about and attitudes toward suicides.

I. Knowledge items How would you rate your knowledge of suicide in the following areas (0=no knowledge, 10=very good knowledge)?											
	No Knowledge										very good knowledge
Suicide prevention	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
Warning signs of suicide	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
To ask someone about suicide	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
Persuading someone to get help	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
How to get help	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10
Local resources for help with suicide	☐ 0	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8	☐ 9	☐ 10

II. Attitude items How likely it would be for you to do the following things			
	not very likely	somewhat likely	highly likely
Ask someone if they are suicidal			
Tell a suicidal subject whom to talk to for help			
Call a crisis line to get help for someone you believe is suicidal			
Go with a suicidal person to get help (e.g. hospital, mental health centre)			
	never	sometimes	always
If you believe someone is thinking about suicide, would you feel that asking them about suicide is appropriate			

Table 5.8-3: Description of data collection process.

When	What (name variables), where, how, target quantity of data
15.11.13	Data on participants' knowledge about railway suicide (warning signs, prevention, facts, handling of suicidal subjects, referral) was collected at two time points: Baseline assessment shortly before the course (t_1) and post-intervention assessment shortly after the course (t_2). Data on participants' attitudes toward railway suicide (communication with and support of suicidal subjects) was collected at two time points: Baseline assessment shortly before the course (t_1) and post-intervention assessment immediately after the course (t_2).
Feb/Mar 2014	Three months after the intervention, long-term memory data is collected on participants' knowledge about railway suicide (warning signs, prevention, facts, handling of suicidal subjects, referral) and participants' attitudes toward railway suicide (communication with and support of suicidal subjects).
April 2014	Evaluation of knowledge about and attitudes towards railway suicides at three time points is completed

5.8.5 References

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Berlim MT, Perizzolo J, Lejderman F, Fleck MP, Joiner TE: Does a brief training on suicide prevention among general hospital personnel impact their baseline attitudes towards suicidal behaviour? Journal of Affective Disorders 2010, 100:233–239.

5.9 Pilot test 9: Gatekeeper Programme – the Netherlands

Authors: Angela van der Veer and Bart Hoogcarspel (Prorail)

5.9.1 Description of the measure

Overview

ProRail and NS (largest railway undertaking in the Netherlands) have developed a one-day gatekeeper course for people working in the railway environment. This course was developed during the year 2013 after the example of the Samaritans/Network Rail course “Managing Suicidal Contacts” in the UK and adjusted to the Dutch context.

ProRail and NS took the Samaritans course in the UK and researched the content of the course in cooperation with TNO institute (www.tno.nl). With the training bureau Pragmavision (with specific training experience with people in railway courses) the course was further enhanced and developed, in cooperation with one of the Samaritans trainers who helped train the Dutch trainers.

The course takes 6 hours (from 9.30 to 15.30 o’clock). The group consists of 9 to 12 participants.

The course consists of a work book with examples, exercises and information. Following a PowerPoint presentation, the trainers guide them through the facts concerning suicidal conduct. They are guided through recognising suicidal behaviour and they exercise with approaching suspicious people and starting a conversation with them.

They participants learn how to:

- Make contact.
- Move to a safe place.
- Listen.
- Refer (to crisis hotline 113Online).
- Conclude.

The course teaches the participants to actually start a conversation with a possibly suicidal person and acting on a gut feeling that something is wrong.

Objectives

The course intends to provide railway personnel, or people working in the railway environment, with the (mental and content) tools to intervene in situations where they feel they are dealing with a suicidal person. They learn to recognise suicidal people and how to overcome their hesitation to address the people they suspect to be suicidal. Not only to remove a suicidal person from the railways and thus preventing a suicide incident, but also giving a possible suicidal person a better chance to receive further mental help.

Effect mechanism

The hypothesis is that after taking the course, railway personnel will feel better equipped to recognise, act on, and deal with vulnerable or suicidal people. And will do so, thus preventing a possible incident from occurring.

5.9.2 Previous experiences of similar measures

In the UK the Samaritans/Networkrail course resulted in training 3000 employees and it lead to many interventions. Feedback if an intervention occurred after taking the course was not

mandatory. This made it difficult to count the number of actual interventions. Nevertheless they recorded 200 voluntary stories of interventions, which imply that suicides were prevented.

5.9.3 Implementation

During the course of the year, NS and ProRail officially made it a joint effort and responsibility to give the course to their frontline staff and people working in railway environment. After two pilot sessions and one information session for management, ten course days were held between October and December 2013) to various people from the target group, in total approximately 100 people. Other responsible partners were the training bureau (two main trainers, 1 back-up trainer) and Railinfra Opleidingen, the organisation to take care of all the facilities for the course (invitations, meeting rooms, lunch).

Lessons learned:

- It was important to have combined groups of people; not only in position, but also in organisation they work for (NS, ProRail or other company). This enables a better understanding of other people's work and experiences in a similar incident.
- The experiences the people had and talked about should not be underestimated either. On the one hand it made the organisers realise to focus on a safe environment to enable these discussions, and on the other hand also make sure there was a good plan to provide mental support to the participants if necessary, before, during and after taking the course.
- The effect of the course on the trainers should not be underestimated. This is not an everyday course to give. Emotions can arise from every angle.
- The selection of course participants is important. The organisers need to be careful who to invite to the course and make sure that management is able to provide back-up for mental support for the participants if necessary.
- There seemed to be a great need for such a course.

5.9.4 Evaluation method

<u>In-depth interview study</u>

An in-depth interview study was conducted to measure:

- the need for the course;
- to what extend the course offers modes of conduct and approaches suitable to the real-life experience of railway personnel;
- strong and weak points in the course.

For these interviews railway staff was selected who experienced a situation where they had interaction with a potential suicidal person. The selected railway staff did NOT attend the course. The interviews have been conducted by an external, independent researcher, who visited the railway employees at a location they selected themselves. Selected railway staff voluntarily agreed to be interviewed. Each interview focused on one actual incident. The incidents were on a train platform (50%) and along the tracks (50%). The researcher conducted each interview on one or two railway-employees that were involved in the incident.

The developed interview script asked for:

- general information about the employee(s) (personalia), such as position and number of years employed which can indicate something about his/her experience and approach to the situation;
- specific information on the incident as it happened such as circumstances of the shift (early-day-late), description of the shift (what happened), location of incident, sense of the incident (clear or exploring, or confirmed by the (suicidal) person), manner of contact (for example: verbally addressing or approaching the person, physically pulling them away, calling to the person from a distance, etc.), manner of warning the emergency services (who, and why this manner), content of the conversation while awaiting the moment of referral, contact with emergency services and referral, personal emotions (how did you deal with them?).
- what a person would do differently next time and what he or she would you recommend a colleague should this happen to him/her?
- if one lacked knowledge or skills in dealing with this situation?

An interview took 1.5 hours at the most. Writing a report on the findings also did not take longer than 1.5 hours per interview.

Effect analysis

The effect of the course 'Managing suicidal contacts' (Contact met (mogelijk) suïcidale personen) was measured by a before-after study with a control group.

A questionnaire with the following aspects was created:

- knowledge about suicides on the railway;
- what behaviour is best in these situations;
- fear/hesitation to deal with suicidal people;
- interventions or contacts.

Each aspect contained 3-5 questions. For each question we created three varieties. In each individual questionnaire one of the three varieties was randomly chosen to prevent that the questionnaire became a routine.

All participants of the course were asked to complete the questionnaire **before** taking part in the course. **Three months after** the course an invitation for the questionnaire was sent by email to each of the participants. To complete the evaluation the questionnaire will be sent for a third time **one year after** the course (at the end of 2014), but this will be outside the RESTRAIL time frame. This is the participants-group.

To check the results all participants in the course were asked to name a colleague, who did not follow the course (yet). Those colleagues were also invited to fill out the questionnaire. This is what is called the control group.

The questionnaire was put online in Qualtrics, an online research module for social research. This survey was supervised by NS and ProRail.

5.9.5 Collection of evaluation data

In-depth interview study

In total, 10 interviews were held with 11 employees of NS, the largest railway undertaking for passengers in the Netherlands. Two employees took the interview together, because they also made the intervention together. Interviews were held in January and February 2014. The location of the interview was chosen by the interviewees.

Effect analysis

An internet survey was used using Qualtrics as a tool. The participants-group contained a total of 100 employees. About 50% of them responded to the questionnaires. The control group had a total 16 persons who filled in the questionnaire.

The first course started in October 2013. Estimation is that the entire survey will be ready in the spring of 2015 (excluding the follow-up questionnaire after a year, which will be sent at the end of 2014 to both test group and control group).

5.10 Pilot test 10: Enhancement of cooperation of the police and legal entities through Computer Based Training

Author: Gilad Rafaeli (MTRS3)

5.10.1 Description of the measure

Overview

A key issue for IMs, who lead the rail industry's response to incidents, and also for RUs, is minimising service restoration time, whilst providing the police with necessary support to allow them to meet their legal responsibilities. The police, with the exception of the railway police, and also other specialists they involve on or off site, may not be familiar with the implications of managing suicides and fatal trespassing incidents on rail infrastructure on rail operations and safety. In many municipal or regional police forces, and in some Member States, the judicial entities (general prosecution, judge on call), have incident response decision making roles that critically affect traffic restoration time.

The computer based training (CBT) module is intended for decision makers dealing with railway incidents, primarily the police, and also other decision makers among the executive or judicial authorities (the representative of the general prosecution and the judge on call).The purpose of this tool is to enhance the understanding of these decision makers of the manner in which suicides and fatal trespassing incidents on rail infrastructure are handled, with the aim of improving their cooperation with the IMs and RUs, and thus supporting quick resolution, to allow restoration of traffic.

The CBT will be developed as an interactive tool, thus the trainee will not only follow the topics of the lesson step-by-step, but will also answer multiple choices questions and make use of other interactive learning methods that are embedded into the CBT module.

The module will cover the following main topics:

(1) Understanding the problem, its scope and severity

(2) Understanding railways' incident response arrangements

(3) Supporting the railway with the quickest possible incident resolution

(4) Case study

(5) Lesson summary

The duration of the CBT module is up to 45 minutes. It was designed to run on any computer via a standard browser (e.g. IE, Chrome, Safari) are needed for its activation.

Objectives

The objective of the CBT module is to support the quick resolution of suicides and fatal trespassing incidents on railway infrastructure, in order to allow resuming train service as quickly as possible, by explaining the scope and severity of the problem and the incident response arrangements.

Effect mechanism

As the expected effect of the CBT module is the improvement of cooperation between the incident managers of the IMs, RUs and initial responders – primarily the police, it will be evaluated qualitatively.

5.10.2 Previous experiences of similar measures

Many RUs and IMs already include lectures in police courses; disseminate leaflets and/or DVDs prepared specifically for the police, in order to improve cooperation between the various decision makers. Some of these tools contributed to disseminating knowledge, but their effectiveness was limited. The CBT module was developed to fill this need and it is not only an upgraded information dissemination tool; it also includes interactive features that promote learning by making the experience more interesting and effective.

5.10.3 Implementation

The implementation of the CBT module included the following actions:

(1) Preparation of a general template for a PowerPoint presentation

(2) Preparation of the CBT module using PowerPoint, including narration

(3) Review of the PowerPoint output by different partners (VTT and UIC)

(4) Development of general assessment criteria for the CBT module

(5) Completion of the development of the CBT module using Articulate

(6) Review of the CBT module by RESTRAIL consortium members

(7) Development of the on line CBT evaluation in Word format, review of the document and integration of the evaluation questions into an on line an evaluation service (‘SurveyMonkey’)

(8) Evaluation of the CBT module by RESTRAIL partners, RAILPOL members and the Swedish police academy.

Screenshots taken from the CBT module are displayed below as Figure 5.10-1 for part-1, **Figure 5.10-2** for part-2, and **Figure 5.10-3** for part-3.

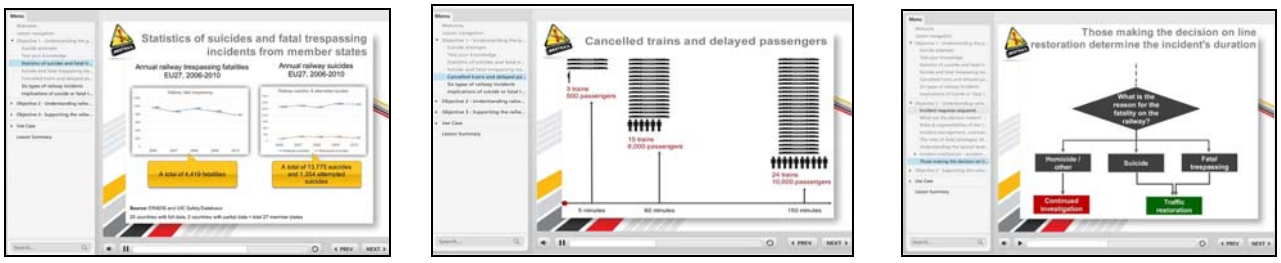

Figure 5.10-1: Screenshots from CBT module – part 1.

Figure 5.10-2: Screenshots from CBT module – part 2.

Figure 5.10-3: Screenshots from CBT module – part 3.

5.10.4 **Evaluation method**

The evaluation of the CBT is detailed in a CBT evaluation form (ref: RESTRAIL-WP5-MTR-TEC-004-0114-A-CBT Evaluation Form), which was integrated into an on line survey service (www.surveymonkey.com). The evaluation form includes the following fields:

(1) General questions – place of employment, and several questions regarding the individual's familiarity and experience with suicides and fatal trespassing incidents.

(2) Content and impact evaluation of the CBT module – clarity, relevancy, duration, effectiveness, impact and contribution.

5.10.5 **Collection of evaluation data**

Evaluation data will be collected via the on line survey (SurveyMonkey), and presented in the following formats:

- Tables: A table for each question, indicating the number of evaluators responding to each question, and the percentage of evaluators for each answer.

- Charts: A histogram for each question, detailing the number of evaluators responding to each option and the percentage for each answer.

5.11 Pilot test 11: Forward Facing CCTV in trains

Author: Paul Abbott (MTRS3)

5.11.1 Description of the measure

Overview

The Forward Facing CCTV (FFCCTV) system is intended to serve the three central entities involved in the investigation of fatal human-train incidents, resulting from suicides or fatal trespassing: the RU, the IM and the police investigating the incident. Its purpose is to assist the police in determining the nature of the incident – suicide, accident or murder – as a key input for the actions required in their investigation. The use of FFCCTV benefits the RU and IM, as it is a means of helping minimise the incident investigation time, reducing the line or system shut down time, and allowing resuming operation as quickly as possible.

FFCTV is utilised by many RUs and IMs for investigating incidents. RUs & IMs met with to date have stated that that the system has proven to be beneficial, although there was little specific quantitative or qualitative data available to determine the extent of its benefits.

A typical FFCCTV system includes four operating modes:

(1) *Active mode*. The camera and recorder are connected to a power supply, and the system is fully functional. In this mode, the status display panel shows that the system is operating properly.

(2) *Inactive mode*. The power supply to the camera and/or recorder is disconnected, or alternatively, the system is connected to the power supply and the camera, but is switched off.

(3) *Debriefing mode*. An external viewing device (laptop, tablet or smartphone) is connected to the system for the purpose of viewing recorded video or by desktop application where a wireless communication link is available between the train and the wayside network.

(4) *Malfunction mode*. The system is connected to the power supply and to the camera, but there is a malfunction in the system (whether power, communication, hardware, software), which is displayed in the status display LED.

Objectives

The objectives of the FFCCTV field tests are:

(1) To quantify the effect of this tool as expressed in the police investigation time and the railway system shut down time.
(2) To examine the ways in which the broader use of FFCCTV would benefit the involved RU, IM and police.
(3) To examine the user requirements, a pilot measure was originally planned based on the installation of a mobile FFCTV unit (a portable recording and viewing case) in one or two driver's cabins. However, due to problems in obtaining an RU's agreement, it was decided to adopt a different approach: interviewing the principal organisations involved to explore the issues involved, collect information about the experience gained by RUs using FFCCTV, as well as about the costs (CAPEX and OPEX).

(4) To consider how future developments in FFCCTV technology could add to the benefits of its use.

Effect mechanism

The key benefit of the FFCCTV is its ability to help the investigating bodies, primarily the police, to investigate incidents resulting in fatalities on the railway infrastructure by viewing the recorded video. The video would allow determining whether these were suicides, trespassers killed by trains or homicides. In the case of the first two – this would allow the earliest possible conclusion of the site investigation and allowing the quick resumption of traffic.

5.11.2 Previous experiences of similar measures

In recent years considerable experience has been acquired by RUs in Europe with FFCCTV installed on board their rolling stock, whether as retrofits or through the procurement of new trains already supplied with this system. However, the information concerning the effect of FFCCTV as a contributing factor to the investigation of suicides and fatal trespassing incidents is insufficient, mainly because RUs and IMS do not collect relevant data on such incidents, which would allow performing a quantitative assessment.

5.11.3 Implementation

The FFCCTV evaluation was implemented via surveys and questionnaires covering the following issues:

(1) Technical information about the equipment installed – the camera, recorder, viewing software, video export means, wireless data / video transmission, etc.

(2) Method of use of the incident investigation system – methods and procedures guiding the incident investigation based on data supplied by the system.

(3) Costs – CAPEX and OPEX costs of the system, including design costs, procurement of equipment and spare parts, integration costs and operation and maintenance costs during the system's life cycle.

(4) Additional benefits – identification of other benefits achieved by the installation of FFCCTV, such as enhancing the response to additional security and safety risks and to other operational needs.

The information was collected via surveys and questionnaires from the following organisations:

- Virgin Trains – RU using FFCCTV
- Greater Anglia – RU using FFCCTV
- South Eastern Railway – RU using FFCCTV
- British Transport Police (BTP) – Rail incident investigation role
- Network Rail (IM) – incident response management
- Guiding Lights Technology Inc. – FFCCTV manufacturer
- R2Protec – FFCCTV manufacturer

5.11.4 Evaluation method

In order to evaluate the effectiveness of the FFCCTV, an analysis of its use and benefits in suicide and fatal trespassing incidents on railway infrastructure will be conducted, based on the following:

(1) The opinions of RUs, IMs, the BTP and manufacturers concerning the additional benefits of using FFCCTV for incident response and investigation;

(2) Data relating to the total numbers of such incidents, and specifically of those involving the use of FFCCTV – including the evidence collection and crime scene investigation time;

(3) Decision making processes involved in police classification of an incident as a suicide / fatal trespassing or other, where a 3rd party is involved.

(4) Other issues / responsibilities involved in post incident investigation that affect the decision on traffic restoration, and the time involved from the moment an incident occurs.

(5) Other supporting benefits to RUs and IMs of the use of FFCCTV.

5.11.5 Collection of evaluation data

Data concerning the issues mentioned in 5.11.3 above were collected via questionnaires and surveys.

6. SUMMARY AND CONCLUSIONS

The pilot tests described in this document were conducted especially to improve the current knowledge about the impacts of selected measures against railway suicides and trespassing accidents, the occurrence of these events or their consequences. The pilot test descriptions are focused on the monitoring of the implementation process and collection of data for the evaluation of the effects. Therefore this document provides important information about the implementation process for those planning to implement similar measures. The results of the evaluation of the effectiveness of these piloted measures will be reported in D5.2.

Selection of pilot tests

The WP5 partners selected the measures to be implemented in their country independently from measures that were categorised as recommended or promising in the earlier stages of the project. It was acknowledged that partners' possibilities to organise pilot tests depended on several factors, e.g. on the type of measure the partners preferred, allocated resources for the implementation and evaluation of the measure, cost of measure, time available for the completion of the test and the interest and willingness of the corresponding stakeholders (e.g. railway authorities and undertakings) to cooperate in the implementation.

The piloted measures in different countries were:

- Warning signs and posters (Spain)
- Railway safety museum education programme for children, young people and families (Spain
- Education at schools for 8–11 year old children (Finland)
- Video enforcement and sound warning (Finland)
- A combination of measures at Aydin station (Turkey)
- Mid-platform fencing (United Kingdom)
- Societal collaboration to prevent railway suicide (Sweden)
- Gatekeeper programme (Germany)
- Gatekeeper programme (the Netherlands)
- Enhancement of cooperation of the police and legal entities through computer based training (Israel)
- Forward facing CCTV in trains (Great Britain)

When looking at the Tables 2.1.1–2.1.3 we can see that the pilot tests will provide valuable new information on the effectiveness of different measures. Some earlier studies investigating the effectiveness of some of the piloted measures exist (e.g. posters, education at schools, fences and CCTV combined with sound warning) but there are also measures implemented by WP5 partners with no previous results concerning their effectiveness. Some people might argue that in optimal situation WP5 partners should have piloted only measures with no previous information on their effectiveness. However, due to the differences e.g. concerning the railway environments, local circumstances and cultures among different countries even the implementation of previously tested measures will provide valuable information on the practicalities related to the implementation (including the acceptance) and on the effectiveness of these measures in different locations and countries.

Overview of piloted measures

The final list of piloted measures included two types of measures: 1) Measures which were specifically set up for the purposes of RESTRAIL project (e.g. *Warning signs and posters* and

Video enforcement and sound warning), and 2) Measures which were completely or partly implemented already before the start of WP5 and thus the focus in the frame of RESTRAIL project was on the evaluation of the effect of these measures on the number of trespasses and/or railway suicides (e.g. *Mid-platform fencing* and *Gatekeeper Programme* in the Netherlands).

Some piloted measures were targeted to prevent suicides (*Gatekeeper programmes* in Germany and the Netherlands, Swedish *Societal collaboration*), some aimed to prevent trespassing (*Warning signs and posters*, *Education in Schools and railway museums* and *Video enforcement and sound warning*), some targeted both suicides and trespassing (*Mid-platform fencing*, *Measures at Aydin station*), and some were mainly for the mitigation of consequences (*Computer based training* and *Forward facing CCTV*).

The scale of the pilot tests varied. The variation was somewhat related to the resources of each partner but in addition it depended on the involved of national infrastructure managers and their willingness to support the implementation of the pilots. We had for example three pilots concerning stations. Both the Spanish and Turkish pilot tests were implemented in one station whereas the British study of *mid-platform fencing* covered installations in more than 50 stations. The Spanish pilot test included installation of warning signs and posters in the station area whereas the Turkish pilot concerned the treatment of the entire station area and consisted over several interacting measures. The other example on the variation on the extent of the implementation concerning the *Gatekeeper programme* which was implemented both in the Netherlands and in Germany. In the Dutch *Gatekeeper programme* targeted about 100 railway employees whereas the German *Gatekeeper programme* included one training session with 12 participants.

All pilot tests focused in the evaluation of effects, except the *Computer based training* and *Forward facing CCTV*, which also developed tools for future use in railway undertakings. The material developed in pilot tests concerning the *Education of children* and the two *Gatekeeper programmes* also developed material that can be exploited in future applications of similar measures.

The evaluation methods varied depending on the nature of the piloted measures.

Exploitation of results

The conducted pilot tests were successful in demonstrating that different kinds of measures can be used for the prevention of railway suicides and trespassing accidents. The tests also indicate that measures implemented in one country can usually be used also in other countries without major problems or modifications. Although there are differences between countries e.g. in the organisational structures and environmental factors, no major obstacles for implementation in different countries were detected.

The pilot tests provided useful information about the implementation of measures – the implementation process as a whole and details concerning the implementation of different kinds of measures. Together with the results of the evaluation of all piloted measures (that will be reported in Deliverable 5.2) such information can be directly applied in future implementation of similar measures, and it will also be exploited in the development of the RESTRAIL toolbox.

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