RESTRAIL

REduction of Suicides and Trespasses on RAILway property
Collaborative project

From 01.10.2011 to 30.09.2014

Final report

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

Website: www.restrail.eu

RESTRAIL Consortium

	List of Beneficiaries		
No	**Beneficiary organisation name**	**Beneficiary short name**	**Country**
1	Union Internationale des chemins de fer	UIC	FR
2	Teknologian Tutkimuskeskus VTT	VTT	FI
3	Trafikverket – TRV	TrV	SE
4	Institut français des sciences et technologies des transports, de l'aménagement et des réseaux	IFSTTAR	FR
5	MTRS3 Solutions and Services LTD	MTR	IL
6	Fundación CIDAUT, Fundación para la investigación y Desarrollo en Transporte y Energia	CIDAUT	ES
7	Helmholtz Zentrum München Deutsches Forschungszentrum für Gesundheit und Umwelt (GmbH)	HMGU	DE
8	Karlstad University	KAU	SE
9	Fundación de los Ferrocarriles Españoles	FFE	ES
10	Turkish State Railway Administration	TCDD	TK
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1. FINAL PUBLISHABLE SUMMARY REPORT

This summary report of the project includes 5 distinct parts: (1) an executive summary, (2) a description of project context and objectives, (3) a description of the main results/foregrounds, (4) the potential impact and the main dissemination activities and exploitation of results, and (5) the description of the relevant contact details.

1.1 Executive summary

The aim of the RESTRAIL project is to reduce the occurrence of suicides and trespasses on railway property and the costly service disruption these events cause, by providing the rail industry with an analysis and identification of cost-effective prevention and mitigation measures.

The project started by identifying the state of the art of best practices and research findings (inside and outside Europe) combined with an analysis of factors (internal to railways or external such as media communication) influencing the occurrence of suicides and trespasses and their consequences, based on official data sources and other collected data. This work considered hotspots and other high risk access points.

This was followed by an assessment of existing countermeasures (technical and soft) for reducing suicides, preventing trespasses and mitigating the consequences on rail operations. Attention was then being given to the development of new approaches particularly those involving soft measures. The project demonstrated some selected measures in order to evaluate the findings and finally develop recommendations and guidelines.

This project is led by railways since it is a rail related topic which aims to answer the concerns of the rail industry.

However an essential feature of the project is the involvement of a wide range of relevant professional expert knowledge in the areas of human science and health, law enforcement, emergency services, education and social services, media and communication, road and rail. This ensures the project output is of practical use to all who can be involved with suicides and trespasses.

The final outcome is a toolbox, accessible through a user friendly interface (for consultation and continuous update) in order to support the decision-makers in taking practical steps to reduce suicides and trespasses and to mitigate the consequences once an event occurs.

1.2 Project context and objectives

Every year, close to 3,000 suicides and an additional 800 trespassing accidents occur on EU railways, representing 88% of all fatalities within the railway system (ERA, 2014). Most of these fatalities occur at stations and on open line, resulting in more fatalities than train derailments and collisions together. In addition to the human loss, suicides and trespassing accidents cause trauma and work-related stress to the railway staff and rescue employees, and discomfort to passengers and eye witnesses (Mishara, 2007; Rådbo et al., 2005). The consequences for train drivers are severe including somatic problems, anxiety, sleep disruption, and sometimes social disturbance

problems (Limosin et al., 2006). After such events, 70% of the drivers are given a temporary sick leave which is on average 4.4 days long (Cothereau et al., 2004). Furthermore, there are additional indirect costs which follow these events. When a person is struck by a train, the traffic shut down time may range from 30 minutes in Japan (Kadotani, Nagai, & Sozu, 2014) to about 2 hours in most of the EU countries (ERA, 2014). The time loss and delays are followed by the costs for emergency services, investigation, insurance administration, and legal procedures (Bureau of Transport and Regional Economics, 2002). These figures are alarming for both governmental authorities and railway companies, for which a key objective has become to prevent suicides and trespassing accidents. In short, railway suicides and trespassing accidents are highly probable events with high impact on society and rail industry.

Research on interventions to reduce railway suicide and trespassing behaviour is limited and very few studies have systematically investigated the effectiveness of potential countermeasures (Lobb, 2006; Rådbo, Renck, & Andersson, 2012). In this context, the rail industry needs more evaluation results and practical outcomes form research and innovation projects. When it comes to suicide and trespass related incidents, although there is consistent information about injury data, there is no common classification of measures and no integrative tool (1) to lead railway undertakings (RUs), infrastructure managers (IMs) and station managers through the process of selecting from the wide range of preventative and mitigation measures or (2) to provide detailed information on the implementation of those measures.

On this background, the RESTRAIL project aimed to tackle these important issues. The RESTRAIL project was selected in response to this growing cause of concern in the 4th transport call of Seventh Framework Programme (FP7 Programme, SST.2011.4.1-2.: Mitigation measures and good practice to reduce human fatalities and disruption of services resulting from suicides and trespassing on railway property). It is a 3-year project that started on the 1st October 2011 and is co-funded by the European Commission. It is coordinated by the International Union of Railways (UIC) and composed with 17 partners from 12 different countries (Belgium, Finland, France, Germany, Italy, Israel, the Netherlands, Poland, Spain, Sweden, Turkey and the United Kingdom).

The project benefits from a multi-disciplinary expertise: rail companies as well as research centres and universities and manufacturers. The project tries to be as operational as possible, taking into account past and present experience in various European countries and their specific features, in particular sociological, public health, political and administrative aspects.

The project will enhance the efficiency of the railway system by assisting it in responding to fatalities and trespassing accidents which jeopardise its reliability, punctuality and thus attractiveness to potential users.

The pragmatic goal is to provide the decision makers (mainly infrastructure managers, station managers and train operating companies) with a selection of the most cost-effective preventative and mitigation measures, as well as with best practice and evidence-based results concerning the implementation of these measures.

This was successfully achieved through the development of a toolbox which was designed to fulfil three major objectives: (1) to lead decision-makers through the process of selecting from the range of preventative and mitigation measures; (2) to provide more detailed guidance on the implementation of those measures; and (3) to provide a framework for collecting and structuring information in order to feed an accessible and documented database on measures implementation and efficiency across the rail community and beyond.

The project consisted of six work packages. The first work package (WP1) of the project aimed to collect and analyse data related to railway suicides and trespassing accidents. Work packages 2 and 3 assessed the measures targeted to reduce railway suicides (WP2) and trespassing accidents (WP3). Work package 4 (WP4) dealt with the mitigation of consequences by improving procedures and decision making. In WP5 several measures have been selected to be implemented and and the RESTRAIL partners developed 11 field pilot tests in different European locations (e.g., Finland, Germany, Spain, Sweden, Turkey, and UK) in order to provide additional

empirical evidence for effectiveness. WP6 covered the dissemination and exploitation of results through an elaborate dissemination action plan and the development of a toolbox for decision-makers which integrated the scientific and practical information collected and produced during the project.

The methods and main results of each work package are briefly presented in the following part.

1.3 Main S&T results/foregrounds

1.3.1 Data on the railway suicides and trespassing accidents (WP1)

The aim of work package 1 was to collect and analyse data related to railway suicides and trespassing accidents. The work resulted in (1) a description of the state-of-the-art based on a literature review, (2) up-to-date statistics on railway suicides and trespassing accidents compiled from different sources, (3) information on possible countermeasures to prevent railway suicides and trespassing accidents, (4) analysis of the consequences of railway suicides and trespassing accidents, and (5) data on the behaviour of victims prior to the incident.

The data were collected using forms or questionnaires that were completed by RESTRAIL partners, who typically acquired the requested data from documents or by interviewing national experts, and in some cases by organising workshops. In total, 14 countries provided data for WP1. The results of work package 1 provide valuable input to railway community since it is the first attempt to collect information on railway suicides and trespassers together, from a broad range of countries and data sources.

State-of-the-art

The literature review highlighted the main differences and similarities between railway suicides and trespassing events and discussed the preventive measures. These measures can be applied to both events or be specifically targeted to prevent either railway suicides or trespassing accidents.

There are two major international databases concerning railway suicides and trespassing accidents: the ERADIS database maintained by ERA and the UIC safety database. Based on the analysis of these two databases it was estimated that in 2010 the number of railway suicides in Europe was 2,854 and the number of fatalities resulting from trespassing accidents was 782.

According to a survey among RESTRAIL partners more than 40 different (partly overlapping) measures for the prevention of railway suicides and trespassing accidents have been implemented in EU Member States. Furthermore, several ideas on possible new measures were collected. The reported implemented measures concerned especially social measures targeting suicides (e.g. national and local prevention programmes, media guidelines), but also different kinds of behavioural measures (e.g. posters, information campaigns and education at schools), physical measures (e.g. fencing and landscaping) and technological measures (e.g. video surveillance). The information on countermeasures was forwarded to work packages 2 and 3 for further assessment.

The analysis of detailed incident data (provided by 12 countries) showed for example that (a) victims were predominantly males, both for suicides and trespassing accidents, (b) victims were typically between 20 and 59 years of age, (c) railway suicides and trespassing accidents seem to be fairly evenly distributed throughout the year, (d) all weekdays are represented quite evenly, and (e) suicides were almost always committed by persons alone, and even in trespassing accidents there was seldom more than one victim. Most of the received information concerned the age,

gender, timing of events and locations whereas the least information was received concerning the access point, mental health and distance from incident location to home or to closest mental hospital.

Incident investigation

Accident investigation practices and processes vary between countries. The Railway Safety Directive sets the minimum requirements for data collection, but does not regulate the investigation process otherwise. The classification on whether the case was a suicide or accident is most often made by the police or a coroner. The organisations involved in the investigation and their roles vary between countries. In most countries the police are responsible for at least of a part of the investigation. Infrastructure managers (IMs) and railway undertakings (RUs) or specific investigation bodies can do their own investigations.

Railway suicide and trespassing accidents have far reaching consequences for a wide range of actors and agencies within society: amongst them the victims and their families and close associates, train drivers and other witnesses, railway companies, emergency services and passengers. All countries have guidelines and procedures for managing the immediate consequences of railway suicide and trespassing accidents, and in some cases measures to mitigate the onset and development of post traumatic stress disorder amongst affected drivers. The most commonly collected data regarding impacts concerns damage to humans (number and type of victim and severity of injury) and delays (duration, frequency, number of trains). There are differences in how the financial costs of deaths and serious injuries are calculated in different countries. Average delays range from 45 minutes to 3 hours in different countries and cause considerable inconvenience to passengers as well as having significant operational and financial impacts for railways.

The behavioural data collection analysed material from existing documentation and company records and included four new studies which were conducted to collect behavioural data covering a combination of suicide and trespass context. Even though the conducted studies were exploratory and there is need for more data collection and analysis, the findings suggest that there are opportunities for prevention. The results suggest for example that the industry may need to consider how it can engage more effectively with external organisations and the public who are using the railway, in further efforts to understand and respond with empathy to these complex issues of railway suicides and trespass.

Recommendations

Recommendations of work package 1 were made based on the identified opportunities for learning from these different data sources (e.g. about problems which have been identified through these data, practices for investigation and analysis, and options for prevention) and based on the detailed review of the gaps in the current knowledge base (e.g. about victims, locations of incidents, contributory factors, behaviours, consequences of incidents, uniformity in investigation processes). The recommendations and the more detailed descriptions of actions related to each recommendation are listed in Table 1.

Table 1. Recommendations of work package 1.

Recommendation	Detailed description of actions
Additional data collection	• Establishment of European database for detailed incident data from national sources • Development of European wide guidelines for collection of detailed incident data • Systematic collection of data on frequency of trespassing

	• Raising awareness in the railway companies on the importance of collecting data on railway suicides and trespassing accidents to be used as a basis for their decision making
Additional analysis	• Making the assessment of effectiveness a regular element in all plans concerning the implementation of preventative measures • Developing common methods for the determination of factors contributing to individual trespassing accidents • Considering in-depth case studies of limited number of suicides and/or trespassing accidents, to gain knowledge of specific features of incidents that are not included in the routine collection of detailed incident data • Analysing behaviour in accidental and suicide events from larger samples of pre-existing documents or other sources of data to have better understanding of behaviours that indicate risk of subsequent incidents
Better access to information	• Enabling and facilitating access to relevant databases, for researchers but also for the general public • Making the results of studies on railway suicides and trespassing accidents available to the interested parties more widely, especially to those working in the railway sector • Promotion of publication of results from studies and experiments in scientific publications, even if the results are not as positive as expected
Encouraged cooperation between organisations	• Cooperation between organisations involved in investigations of railway suicides and trespassing accidents to enable exchange of documented information on the incident

1.3.2 Assessment of measures targeted to reduce railway suicides and trespasses (WP2 and WP3)

The two work packages WP2 & WP3 were dedicated to analysing the best practices (technological and non-technological) and identifying, when possible, cost-efficient measures to prevent respectively suicide (WP2) and trespassing (WP3) accidents or incidents. The main tasks focused on the assessment of identified countermeasures (technical and soft) for preventing suicide and trespasses, taking into account the research findings and good practices IMs and RUs. Attention was given to the development of new approaches of soft measures to avoid suicide and trespassing accidents.

The process has been successful in discriminating differences between different types of measures and a shorter list of more promising preventative measures for suicide and trespass have been identified. These measures were considered suitable for more in-depth testing in RESTRAIL. Some of the selected measures are currently being tested in a set of pilot field studies carried out in WP5. The detailed information that has been collected during WP2 and WP3 is a useful resource and is being used as a basis for some initial guidance for implementation of the measures. It is anticipated that this information will be developed with partners during the field testing stage of the project, to produce a robust set of guidance that will be available to railway organisations at the conclusion of the project.

Development of a method for the evaluation of measures

An initial set of 83 preventive measures to reduce the occurrence of suicide or trespassing, either used already or proposed by project partners, national IMs and RUs, has been grouped into 38 families of measures in which the modes of action for incidents and accidents are similar, using a safety barrier model. Since overlapping exists between preventive measures against suicide and trespassing, a model has been proposed to take into account shared and specific suicide and trespassing characteristics. The model also makes it possible to visualise how each stage of the suicide or trespassing processes can be linked to certain families of measures.

Several criteria were chosen for the evaluation procedure: (1) durability of effects, (2) costs and benefits (based on expert judgment and not on calculation of the C/B ratio), (3) integration with other policy measures, (4) impact on railway operations, (5) impact on people and jobs, (6) technological issues, (7) environment, (8) acceptance, and (9) transferability issues.

Assessment of suitable measures (technical and soft)

The objectives of the work conducted were to assess preventive measures identified from WP1 taking into account the experience of IMs, RUs and other users. Since measures geared towards preventing suicide cannot always be clearly distinguished from those aimed at preventing trespassing, and as those measures were reviewed and assessed using the same process, experts and criteria, the decision was taken to combine the output into a joint deliverable referring to the prevention of both suicides and trespassing accidents.

The assessment process took into account factors and information that could impact the success of measures if they were applied in different European environments, and drew conclusions on a list of measures defined as recommended and promising. The 38 families of measures were assessed by a group comprising 21 members of WP2, WP3 and external IMs. Each family of measures was assessed separately for suicide and for trespassing. A set of available data was used for the preliminary classification that allowed sector experts in a second phase to assess the principles for classifying measures as “Recommended” or “Promising”, i.e. effective, cost-effective, and free of shortcomings. Three main sources of information were used: the preferences of IMs and RUs; estimates of impact at European level; weighted and individual scores according to 11 criteria representing implementation practicalities for each family of measures.

Table 2. Preventative measures against railway suicide and/or trespass.

Family of measures	Classification for suicide	Classification for trespass
1. Targeted campaigns (including shock campaigns)	Recommended	Promising
2. Fences and barriers at specific parts of stations	Recommended	Recommended
3. Fences and barriers at locations outside stations where people take shortcuts	Recommended	Recommended
4. Surveillance to deter based on patrols	Promising	Promising
5. Mass media campaigns	Promising	Promising
6. Risk assessment (e.g. of stations, special circumstances, risk groups etc.)	Promising	Promising
7. Monitoring and learning from research and best practice	Promising	Promising
8. Collaboration between organisations and agencies	Promising	Promising
9. Surveillance and light to influence behaviour	Recommended	-
10. Detection system combined with sound warnings	Recommended	-
11. Increased visibility by lighting at railway crossings, tunnels and hotspots	Promising	-
12. Increasing visibility through removal of vegetation	Promising	-
13. Surveillance based on local intelligence (e.g. from police, health authorities)	Promising	-

14. Media Guidelines	Promising	-
15. Emergency information at stations (signs, posters, information on screens etc.)	Promising	-
16. Societal collaboration to prevent railway suicide and trespassing accidents	Promising	-
17. Emergency button at unstaffed stations	Promising	-
18. Training of staff - Gatekeeper training	Promising	-
19. Education and prevention in schools and outside of school	-	Recommended
20. Warning signs and posters to address trespassing	-	Recommended
21. Prohibited access signs	-	Promising
22. Training of staff - General Awareness Rising	-	Promising

The assessment procedure resulted in a set of recommended and promising measures as well as an outline of the factors affecting successful implementation of the measures. In addition, implementation issues connected to the “Recommended” or “Promising” measures were also considered. The method has demonstrated the capacity to support the analysis and selection of measures: 8 families for suicide and trespass, 10 families for the prevention of suicide and 4 families of measures against trespass (see Table 2).

New approach of soft measures for the prevention of suicides

Among the whole set of preventative measures, special attention was given to the “soft” measures against suicide and trespass. These are influential, social, or psychological measures dedicated to influence the actors’ knowledge and attitudes and to deter risky behaviours by calling for more socially-responsible actions or for voluntary decisions to comply with the safety rules.

Soft measures against railway suicide include the design and placement of signage and posters in a railway environment, advertising crisis hotlines, mass media campaigns and media guidelines or local prevention campaigns, intervention at schools and provision of educational materials, briefing of station staff or security personnel, announcement in trains and at stations, gatekeeper programmes and hotspot analysis and education.

The analyses show that several soft measures against railway suicides are implemented in European countries and worldwide. Soft measures are often a part of a more general suicide prevention measure.

In order to assess information on existing and emerging soft measures against railway suicides in Europe and worldwide and their degree of implementation, a survey was designed and conducted among RESTRAIL partners. Surveys were also conducted with Bahnhofs Mission, German train drivers union, and among Spanish engine drivers.

The analysis showed that:

- *Awareness rising programmes* are implemented in five European countries media approaches in six.
- *Help lines* are offered and operated in many countries, but only in five countries is the information about the hotline displayed in a railway environment.
- *Poster campaigns* were also launched in five countries.
- *Suicide hotspots* have been officially identified in nine of the countries but only five report that actions have been taken at the identified sites.
- Ten countries have *special announcement* to passengers waiting on stations and in trains and even though all countries avoid using the word “suicide”.

- *Gatekeeper programme* is yet only implemented in Great Britain but several different European countries are planning on setting up gatekeeper programmes for frontline staff.

New approach of soft measures for the prevention of trespassing

In order to analyse the development of new approaches to soft measures against trespassing, two complementary approaches were used: (1) quantitative criteria to distinguish the new measures from mainstream approaches in the current literature and (2) qualitative criteria to define innovative approaches from the viewpoint of railway safety experts who participated in several focus groups in Spain, France, and Turkey. The main results suggest that effective interventions which emerge as 'innovative' are based on integrative approaches to soft measures.

- *New approaches to education*. Risk awareness should be raised at locations close to the tracks such as bars, taverns, nightclubs, sport centres or arenas, bicycle paths, shopping centres, cinemas, new residential areas, or squatter camps on vacant land. Education should be also targeted towards urban planners and community representatives. Lastly, education campaigns should not be conducted in isolation, and should be reinforced by punitive measures.
- *Innovative collaboration between institutions and agencies*. A joint work is needed within communities, between IMs and RUs on one hand, and urban planners, local authorities, municipalities, etc. on the other. However, railway companies could look for new collaboration partners such as chambers of commerce, local stores, unions, media, youth, city planners, transportation engineers, manufacturers, and bystanders.
- *'Soft' approaches to physical barriers*. Fences may in fact be used as psychological deterrents rather than simply physical barriers, indicating the boundary of an area with restricted admission. It has been suggested that smearing the bars of fences with heavy grease as a further means to reinforce their deterrent effect on behaviour.
- *Training railway staff to dissuade certain groups of trespassers*. This measure depends heavily on each country's specific context. For example, in France new approaches to training are not necessary, but in Spain there is demand for training maintenance personnel in order to develop their skills in detecting and warning trespassers. Similarly, in Turkey the staff need emergency situation and anger management as well as communication training, to help them manage difficult situations with third parties.

1.3.3 Mitigation of consequences by improving procedures and decision making (WP4)

Another objective of RESTRAIL is to develop methods and technological tools that can be integrated with existing procedures and technologies in order to achieve the most effective and cost-efficient means of mitigating the potential impact of suicides and trespasses on railway infrastructures.

The first part of work package 4 identifies numerous interfaces to and between IMs, RUs and police forces involved in managing suicide or fatal trespassing incidents. Clearly, in order to mitigate the consequences of such incidents, system shut down time must be minimised. Therefore, the added value of these deliverables comprises soft and hard products, which aim to improve the full range of operational and technical arrangements that enable this objective to be met whilst enabling the responding organisations to meet their legal responsibilities.

The operational arrangements, represented by the information reference source will support the stakeholders as they assimilate the identified methods, tools, procedures and managerial models in order to reduce the shut down time associated to suicides and trespassing incidents.

The technological deliverables - information, situation management and decision support platform, and the line restoration model are meant to improve the situational picture of the incident, the information collection and dissemination tools, the management of the business processes related to the incident response and decision making processes of the involved IM and RU; between them and the first responders, primarily the police; contractors and other RUs.

Consequences mitigation information reference source

This deliverable focuses on the "procedural" aspects associated with mitigating the consequences of attempted suicides, also suicide and trespassing incidents with casualties. It enables the development of a functional information reference source for IMs, RUs, police (state, municipal and railway), fire services and other first responders, regulatory and investigation bodies, which supports response management and consequences mitigation actions, particularly with respect to the shut-down time of railway operation.

The reference source covers the following topics as displayed in Figure 1:

- Incident response arrangements of IM, RU, the police, the fire brigade, emergency medical services (EMS) and others.
- Information management and lines of communication among responding bodies and with decision makers, with emphasis on information sharing and coordination.
- Decision making processes for traffic restoration, including aspects relating to prior agreements among the responders, awareness of rail arrangements, managers' competence and training in handling incidents and decision making on- and off-site.
- Conclusion and recommendations: a summary of the practices associated with the procedural aspects of handling suicide and trespassing incidents with casualties and their impact, and how these might be improved to minimise their impact on rail operations.

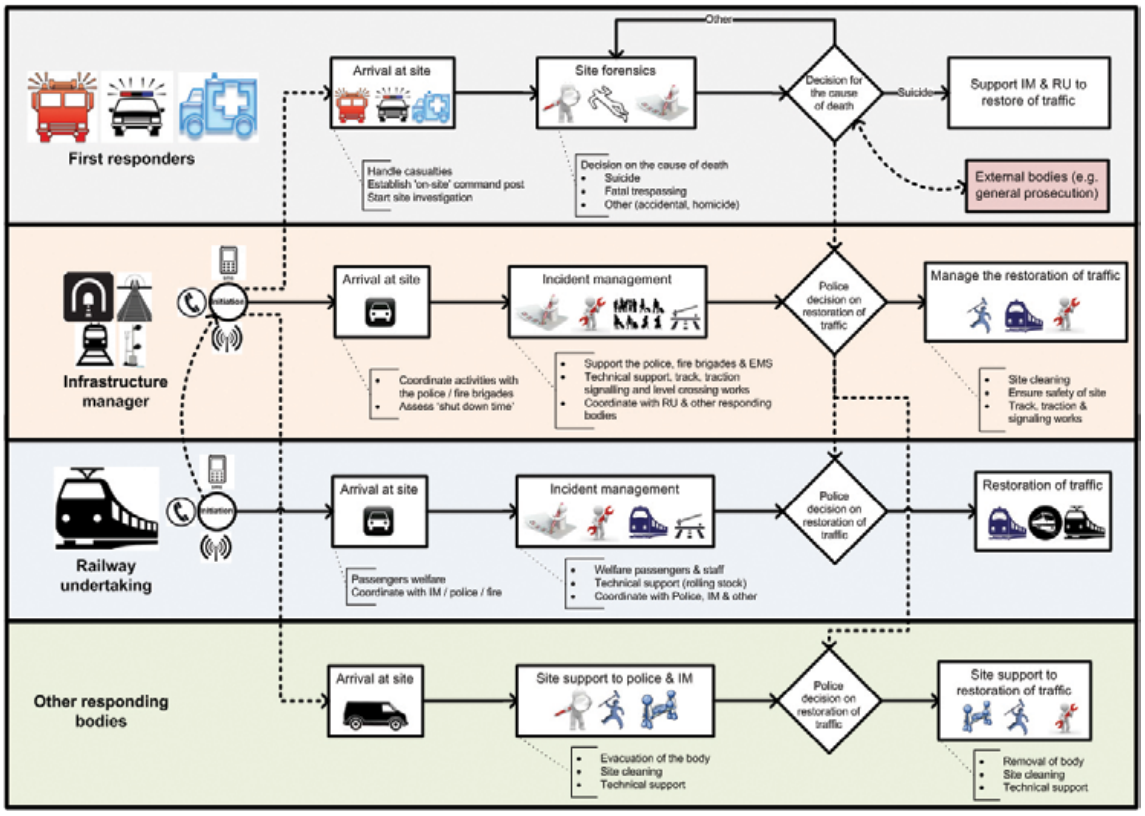

Fig. 1. Incident response responsibilities and arrangements

Information, situation management and decision support platform

Information sharing platforms and effective lines of communication between responding bodies are essential for effective and coordinated incident management. As shown in Figure 2, data shared in real time includes geo-data on the incident location and track access points; information on the site of the incident and on possible involvement of third parties, on train data recording and essential actions as part of the response – safety, assistance to passengers, evacuation.

Fig. 2. Data shared in real time within the platform

This deliverable includes the technical specification and prototype of the situation management system, intended to assist IMs and RUs to achieve the above goals, improve coordination among first responders and help reduce system shut-down time due to incidents with casualties. The system should include:

- ***Full customisation***: Easy-to-use and customise-planning tools and menu-driven operations, and a Business Process Manager (BPM) workflow/rule correlation engine. The business rules, as a set of workflows, will automate the appropriate incident management response.
- ***Hierarchical solution*** multiple layers, which may consist of multiple sites. Each site will be capable of monitoring and managing its own local facility and incidents, systems and client views. Access to higher layers will require authorisation.
- ***Effective and coordinated incident handling via incident execution***: pre-planned incident response workflows will be activated automatically by a time schedule or a sensor alert, or manually by control room operators or field personnel. Incidents can be manually categorised, to present operators with an incident task checklist enabling adaptation to evolving situations.
- ***Intuitive multi-layered Geographical Information System (GIS)-based display with dynamic updating*** to support effective monitoring, decision making and interaction using an IM / RU's existing GIS infrastructure and supporting GIS standards, such as Open Geospatial Consortium (OGC) and proprietary formats (e.g. ESRI, Google, and etc.).
- ***Unified management of all IM and RU video systems***: public video IP feeds, station, way-side and on train forward facing CCTV. The single video matrix relevant to the incident will be automatically displayed, and may be shared among RU and IM. Operators will be able to manipulate cameras as required, to optimise incident handling.
- ***Incident assessment***: time-coded playback of incident handling for debriefing to support improving incident response and for evidential purposes.
- ***Reporting/custom reporting***: automated and fully customisable.

Improving situational picture and communication between control centres – The line restoration model

The Restoration Model was developed to reduce the line operation restoration time following suicide and trespassing incidents. The Model receives information concerning the incident and its handling from the Situation Management System, and uses it to forecast the restoration time. By providing IMs and RUs with accurate as possible information, it allows them to prepare and take necessary action to resume operation without unnecessary delay, as soon as the incident is resolved. The Model's forecasts are of great value to the IMs and RUs, as they allow them to optimise the rescheduling of regional and long distance rail traffic, and also improve passenger service by providing passengers with information that allows them to decide whether to use alternative routes and/or modes of transport.

1.3.4 Pilot field tests and results of the evaluation (WP5)

WP5 aimed to assess a selection of the most promising measures and good practices in order to prevent suicides and trespasses on railway property.

The RESTRAIL WP5 partners have selected several measures to be implemented for field testing, by taking into account the prevention and mitigation measures recommended from the previous work packages and the needs of the corresponding stakeholders. They developed a series of 11 field pilot tests in 8 different European locations (e.g. Finland, Spain, Sweden, Turkey, UK, Germany, the Netherlands, and Israel).

Each pilot test is 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. Some tests focus on measures to prevent suicides only, others on means to prevent trespassing, while others address the consequences of incidents.

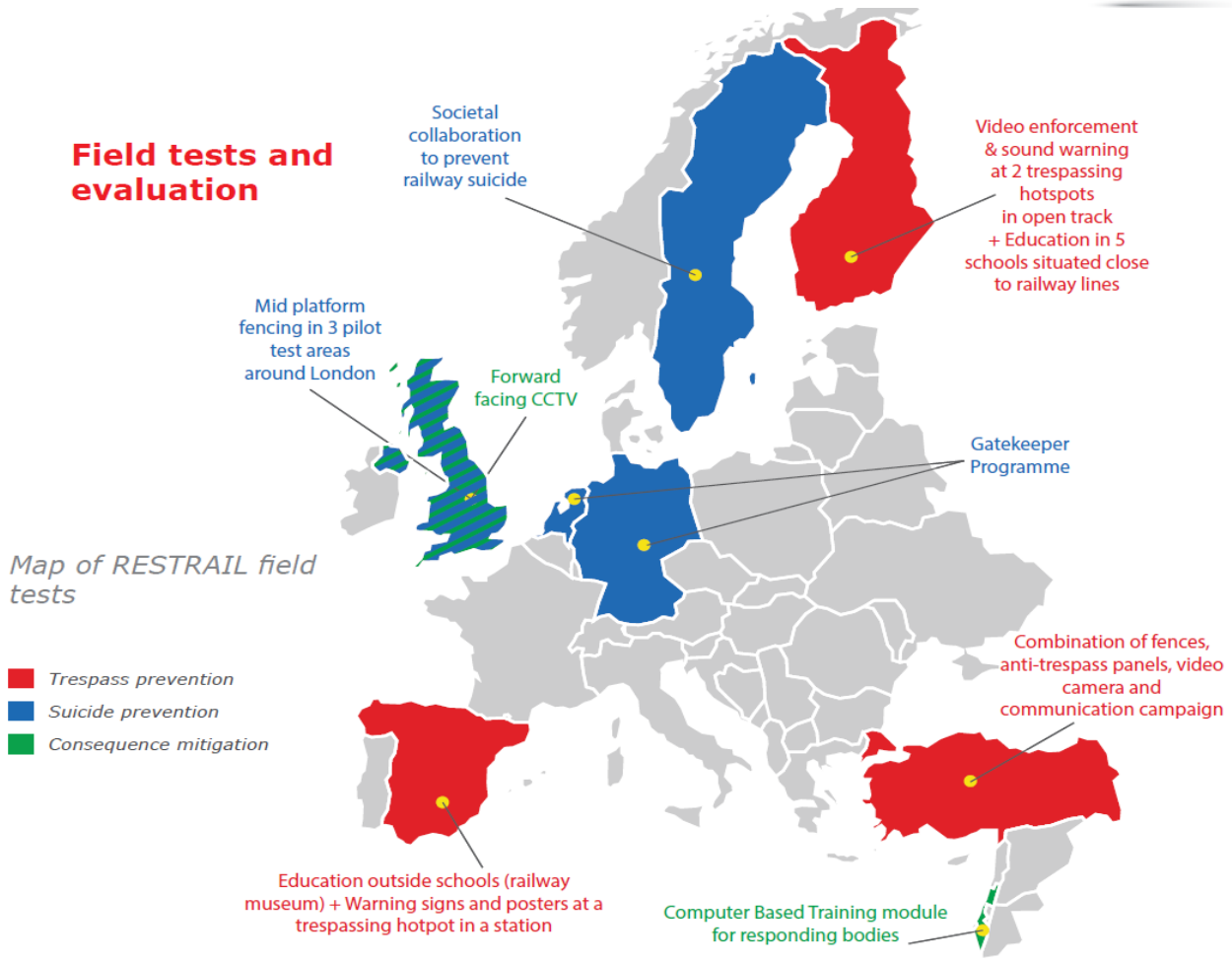

Fig. 3. RESTRAIL evaluation trials (11 pilot tests in 8 countries)

Having implemented the measures, each partner is now collected data and where possible compared the pre and post-study situation evaluation with a view to provide additional support that the preventive measures recommended are effective and feasible.

The evaluations carried out in the RESTRAIL project produced interesting results. Altogether, they provide new recommendations to improve reduce the number of railway suicide, (fatal) trespassing accidents and post-incident consequences. Those results which do not bring new recommendations are in line with the evidence from the literature, and bring new empirical support for the effectiveness of particular measures. All the results and recommendations were included in the RESTRAIL Toolbox.

Lessons learnt in suicide prevention

Concerning the reduction of the number of suicides, the gatekeeper training courses provided an improvement in skills such as knowledge about railway suicide (warning signs, prevention, facts, handling of suicidal subjects, referral) and attitude toward railway suicides (communication with and support of suicidal subjects). In addition to this, the Dutch gatekeeper training course concluded that topics developed in the course are those requested by the employees. Importantly, this type of courses significantly increases the feeling of competence of staff, particularly those with less than 20 years on the job experience, to handle a conversation with potentially suicidal persons.

Furthermore, these types of courses are highly recommended since they are cheap and adjusted easily to different circumstances and settings, and prior knowledge on the part of participants is not required. The contents of the course depend on the local culture and in countries where suicide is not accepted this kind of course will not probably work. Finally this kind of course can be combined with other measures without any problem.

The results of the both evaluations are comparable to those reported in the literature (Berlin, 2007; Cross; 2010). Although gatekeeper training assessed in RESTRAIL have identified that the feeling of competence to handle a conversation with a potentially suicidal person, increases significantly for men and women, for all ages and for all years on the job, except more than 20 year on the job. Furthermore, the need of after care for employees who have experienced contact with potentially suicidal persons is a key issue to be taken into account after the intervention of these employees.

Likewise, interesting recommendations have been obtained from these evaluations:

- It is important to have combined groups of people for the training; 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 that people had and talked about should not be underestimated. On one hand, this can be 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 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.

Another measure evaluated aimed at railway suicides was societal collaboration. This measure has not been evaluated before; therefore this field test has a major added value. According to the results of this particular evaluation, 40 of the 64 persons threatening to commit suicide were found and taken to psychiatric care by the Police. In addition, train services were less disturbed by short traffic stops on more occasions than an actual fatal accident. For example, short traffic stops (involving 25 hours for 64 threats of suicide) where people have been saved can be compared to 4 cases where this was not the case involving trains stopped for 30 hours. This study identified the great importance of the need for very clear communication among the participants and actions to ensure this is achieved.

For the further implementation of this measure, 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.

Another of the evaluations in the RESTRAIL framework targeted to reduce suicide and attempt of suicide has been mid-platform fencing, and this evaluation has been one of the more expected, since whilst there have been evaluations of some types of fencing at railway stations, there have been no previous studies of the effectiveness of mid-platform fencing. This has been an extensive trial in RESTRAIL and is an important contribution to the RESTRAIL project. The findings from the trial are encouraging. There has been only one fatality at fast lines at a station, after mid-platform fencing has been fitted. The results need to be interpreted with some caution. There have been recent incidents at slow lines at a small number of these stations and other stations along the line of route where mid-platform fencing has been fitted. The monitoring period (post-intervention) has been short in relation to many of the stations.

There is need for collection and analysis of statistics over a longer period of time to determine if the fencing is preventing access to fast lines and potentially contributing to a displacement of incidents to other lines or stations. This is one of several interventions that have been applied at stations in GB (e.g. the partnership programme between Network Rail and the Samaritans) and the fencing may not be the only factor that is contributing to any change in the numbers of events at stations. Nevertheless, the evaluation has shown that people like the fencing and think that they work in preventing incidents. There may also be other benefits, such as increasing perceptions of safety while on platforms and the prevention of unsociable behaviour and access to places where people should not be. This type of fencing may be an effective intervention in stations, preventing access to fast lines where trains do not usually stop. It can be used in combination with other interventions (e.g. training of staff, improved surveillance) and should not present problems in transferring to other countries. It can be costly and is not a solution that can be applied and every station. However, this can be a realistic option to consider where there is an appropriate station configuration and a high proportion of non-stopping trains at a platform at the station.

Lessons learnt in trespass prevention

Regarding the prevention of trespassing incidents, two of the evaluated measures were focused on the educational aspects. Education in schools for 8-11 year old children and the Railway Safety Education Programme promoted safe behaviour and habits in the railway environments, in order to educate pupils in the dangers inherent in taking short cuts, playing on the tracks and behaving unsafely at stations. In the case of education in schools, this campaign had a positive effect for all measures studied: level of knowledge related to railway trespassing, reported crossing behaviour, and pupils' assessment of safety related to crossing railway lines. In the same line, the Railway Safety Education Programme achieved an increase in teacher awareness about the need to cover railway safety at school and greater confidence, skills and commitment to do so in the future. Moreover, students learnt about the risk factors related to trains speed, weight and stopping distance and were able to apply this knowledge to explain the repercussions for someone acting dangerously on or near the railway tracks and in a station.

Both measures' findings suggest the children's knowledge of railway safety and their subsequent behaviour is heavily influenced by the actions observed in the adults around them. For this reason, education outside of schools also plays an important role in communications the safely message. In this sense the railway museums have a crucial role in bringing the society closer to the world trains.

These programmes can be applicable in different social contexts, although it is obviously necessary to adapt the contents to the reality of where the measure is being applied and contents should take into account the demographic profile of the target population and the features of the local implementation site. In addition, in the case of applying this educational programme in other contexts, it is also important to bear in mind the fact that children reproduce the behaviours around them. In these circumstances a multidimensional and multi-stakeholder response is required. On the other hand, this kind of programme in the schools could be implemented in other European countries; however the material should be adjusted to comply with local circumstances where courses would be implemented.

Another prevention measure found quite effective to prevent trespassing were the use of warning signs and posters to discourage pedestrians from using illegal crossing places. These can provide information concerning the possibility of being fined if users cross through prohibited or unauthorised places as well as conveying information about the rail safety culture. Even though a general effectiveness seems to be clear, the characteristic of these signs and posters should be adapted depends on the context and country; especially, it should be flexible regarding three main points: content, amount of signs and posters and period of time. Concerning these issues some recommendations have been indicated for the further implementation of these measures:

The design of the signs/posters should be carefully planned. It might be that the same design is not effective in all cultures. For example some train operators could disagree with the message shown as they might not like the depiction of a (recognizable, their company) train on a poster. In addition, it is important that the posters have a language such that everyone can understand its content (i.e. removing old posters and replacing them with posters in a modern language). Finally, it is crucial to be careful with the message "trespassing is dangerous" this could attract potentially suicidal persons to the tracks. It is better to address to "the delays caused by trespassers" and "the number of people that are deceived by those delays".

The amount of signs presented is another important factor to be considered. It should be made sure that there is no unnecessary signing. Otherwise, people could look at the posters without taking much notice of them. On the other hand, paying attention depends on the amount of posters that are installed, in this way, it should be study carefully how many and where the posters are allocated.

And, thirdly, it is important to take into account the period of time the signs and posters are exposed in a determinate area. The effect of posters is likely to be reduced over time. However, this effect could be maintained by replacing the old and ‘grungy’ posters by new ones. Their effectiveness could be increased also by changing the content / design of the posters from time to time (e.g. every year or twice a year a new poster).

As a general idea, the optimal measure would be to combine these signs with targeted campaigns. Furthermore, another successful resource could be to combine these measures with prohibitive signs. Placing signs with the same message next to each other (e.g. one is an icon, the other a picture with text, the other is a prohibitive sign). Finally, it is crucial to receive support from station owners etc. for space to place posters as these may compete with others for space (e.g. displacing advertising revenue). After all, one of the most important factors is government involvement. Budget and political will would be the main paths in order to generalize those methodologies.

Furthermore, another measure addressing the prevention of trespassing was the use of video enforcement and sound warning systems. After implementation the number of trespassing incidents was reduced significantly. However, since no control site was included in the study, the effect reflects not only the intervention but also the effects of other factors such as changes in for example; people needs to cross the railway, season of the year and weather. Some recommendations were arisen from this pilot test for the further implementation of this measure:

1. These pilot tests were not advertised in the media, and the perceptions of the public about the measure were based on their own experiences (and perhaps also the experiences of other people they know). In a way this may have increased the effect of the measure, because people remained uncertain about the possibility of punishment for trespassing. Media attention could also have increased the perception of dangers related to trespassing, and thus improved the effect. It seems likely that adding media campaigns and true threat of punishment to video enforcement and sound warning, its effect on trespassing could be enhanced, at least in the short term. In order to maintain the effect high, media coverage should be maintained and include also information on issued penalties.
2. Overall, video enforcement combined with sound warning can reduce trespassing significantly. In the two pilot test sites the reduction in the frequency of trespassing was 18% and 44%. However, because of the lack of control sites the effect may have become somewhat overestimated. Those who are planning to implement a similar measure are advised to use an expected effect of the reduction of trespassing between 10% and 30%, depending on local circumstances, especially the distance to alternative legal crossing facilities.
3. The pilot test equipment operated on 12 V batteries, which had to be changed weekly. Otherwise the system seemed to work reliable with the exception of a breakdown of infrared sensor at the Tammisaari site (Kallberg, Plaza, Silla, García et al, 2014). The need for maintenance would be much reduced if mains power was used instead of batteries.

4. Video enforcement combined with sound warning suits best to locations where trespassing is concentrated in a limited area, such as a footpath across the railway, where detection of trespasser is more reliable and sound warnings are less likely to be disturbing to those living or moving in the neighbourhood, compared to sites where trespassing is spread to a wider area. Furthermore, mains power should be fairly easily available to avoid the need for frequent maintenance of the system. An obvious alternative to video enforcement and sound warning is fencing, which can be more effective, suits for limited locations where trespassing is concentrated on certain routes and does not need electricity.

Lastly, there was a project, based on the combination of different measures, which included physical measures preventing the access to the railway area and behavioural measures informing the users and public the dangers and illegality of trespassing.

It is not known whether similar combinations of measures against trespassing in railway area have been implemented before. Nor are there results of the frequency of trespassing accidents of such approaches. For this reason, this pilot test has and added value. As was indicated, an important decrease on the number of trespassers was obtained with this project. A reduction of almost 95% on the trespassers was provided. Therefore, this combination of measures could be a good option in order to reduce the number of trespassers in on specific railway area. The issues to be taken into account for the further implementation should be the same than those aspects to be considered in each one of the measures used in this pilot.

Lessons learnt in post incident consequences mitigation

Concerning the measures addressed to mitigate the consequences of these types of incidents, two means were assessed in RESTRAIL project: computer based training (CBT) and Forward Facing CCTV in trains. With regard to the CBT, this training module was effective in making a positive contribution to the understanding by decision makers handling suicides and fatal trespassing incidents of the manner in which such incidents are handled. Collaboration between decision makers, RUs and IMs for effective incident management and the manner in which it can support them in managing these incidents was also emphasised. Altogether this training was considered highly relevant with extremely high effectiveness for RUs and the police. Above all, the means described in the lesson was perceived as valuable to reducing shut-down time as a result of suicides and fatal trespassing incidents.

FFCCTV, with a wireless link providing real time remote access to images by key decision makers, particularly the police, facilitates the earliest possible decision making on the circumstances involved with rail fatalities. Determining whether a suicide or homicide is involved has a considerable impact on system shut down time. Close liaison by RUs and IMs with the police is essential to maximise FFCCTV benefits.

Lessons leant from the Cost-Effectiveness Analysis (CEA) / Cost-Benefit Analysis (CBA)

Mostly CEA (and mini CBA in two cases) were performed with the cost and effectiveness data collected within the WP5 field studies. Unfortunately, it was not possible to perform any preliminary economic analyses in the case of four pilot tests (Dutch gatekeeper programme, German gatekeeper programme, training based on CBT and Forward Facing CCTV), due to various reasons like: (1) lack of time to collect long-term and robust data; unavailability of actual measures of measure effectiveness and/or of other effects and impacts on the network and (2) missing data that make difficult estimating the costs. These difficulties are however, in line with a common observation by authors (World road association, Technical committee C2, safer road operations, 2012) who have indicated that one of the greatest problems in cost-benefit analysis is to obtain valid and reliable monetary valuations of all relevant impacts. This objective is rarely, if ever, fully realized. It is therefore often relevant to carry out a cost-effectiveness analysis in addition to, or

instead of, a cost-benefit analysis. It is worth to note that the CEA results reported for each measure cannot be compared for at least two reasons. First, data were collected in unique contexts. Second, they address at different objectives (e.g. increasing awareness of risk related to rail trespassing by children vs. decreasing the number of trespass-related events). Reported results provides consequently only a first indication of contextualised ratio between costs and effectiveness for one measure in the specific situation where implemented. Although it should be noticed that obtained values provide also no information on how they can be optimally applied and extended to (parts of) the network. Furthermore, the assumptions to be made are still scarcely supported by evidences, as reminded in the CBA/CEA results sections.

CBA are also not directly comparable even if both represent a ratio of monetary values. Beyond the reported limits, we obtained CBA ratio of respectively 2.52 (Mid plat-form fencing) and 4764 (Societal collaboration) representing positive situations. Indeed, CBA ratio greater than 1 will indicate that the investment yields at least the same amount that was invested. In practice, however, one usually consider that a measure is really interesting when it brings more than it costs, i.e. the ratio is much larger than 1. A value from 2 or 5 is considered interesting in economic terms (and a fortiori when it is even greater). Such CBA ratio higher values might be obtained when costs are very low with at least a moderate effect or when the measure is highly effective measure with much higher costs. Nevertheless as it has been said before, these values should not be considered as definitive. Two additional conclusions can be drawn. First, the RESTRAIL frame was very efficient to develop field tests of measures but cannot gather the whole set of data required for conducting CEA or CBA to actually compare between the various options in the same (or very similar) locations. This is probably due to two main factors: (1) the initial overestimation of available published data for setting our calculations and (2) the unavailability of connected theories and evidences between the different measures' objectives with the common goal of decreasing railway suicide and trespass accidents and all their consequences. Subsequently, developing more sound socio-economic evaluations of measures for preventing suicide and trespass accidents will require a whole dedicated project focused on a smaller set of combination of measures leaving more time and more capability to parallelize several experimental and control situation; using controlled characteristics to select the different experimental sites and with measurement tools that enable the collection of all relevant data, during longer periods, and testing several comparable preventative measures and objectives. Secondly, the elaboration of a theory-based framework (Weiss, 1997) is required to accurately support these evaluations and economics estimates. In other words, we'll need an explicit conceptualization of the chosen prevention measures in terms of a theory that attempts to explain how it produces the desired effects (e.g. significantly decreasing the number of rail trespassing accidents) as well as the various relevant impacts (e.g. in terms of Time loss and Delays).

1.3.5 Providing guidance material through the RESTRAIL Toolbox (results of WP6)

All results obtained in each of the field tests as well as the recommendations and lesson learnt during the project were integrated into a toolbox, considered as the final outcome of this project. The main aim of WP6 was to develop the Toolbox – a guide to best practice which summarises the most relevant practical and scientific information collected and produced during the project.

The RESTRAIL Toolbox is a problem-solving guide for implementation of measures to prevent railway suicides and trespassing accidents and to mitigate the post incident consequences. It is the main output of the RESTRAIL research project and it aims to be a helpful, intuitive and user-friendly tool. The content also makes links with scientific publications which support the recommended and promising measures, providing a wide list of references (research papers, research reports, reviews, etc.).

It is designed particularly for the people directly involved in the prevention of railway suicide and trespass. It targets the railway undertakings, infrastructure managers and station managers, but

can be used by all people involved in the process of choosing appropriate preventative or mitigation measures (e.g., decision-makers), as well as safety specialists working with the RUs and IMs or local authorities.

The Toolbox is designed to help the end-users in three ways:

1. lead them through the process of selecting from the range of preventative and mitigation measures,
2. provide more detailed guidance on the implementation of those measures and
3. provide a framework for collecting and structuring information in order to feed an accessible and documented database on measures for implementation and efficiency across the rail community and beyond

The RESTRAIL Toolbox meets the current needs of the railway industry. It is a tool which provides a systematic but flexible approach, allowing various end-users inside and outside the railway industry to adapt it to their specific needs in accordance with particular national / cultural problems when dealing with suicide and trespass problems.

The toolbox has been developed through a systematic process which began with state-of-the-art reviews and the collection of international data and best practices. The toolbox was then drafted in several stages, with systematic evaluations after each draft. Each working version has been reviewed by the RESTRAIL consortium. Additional evaluations were conducted through two joint workshops during the RESTRAIL mid-term conference held in Paris on the 12 June 2013. These workshops provided external evaluations from actual end-users and enabled us to make adjustments according to their needs and feedback. The content is continuously being improved based on further information provided by RESTRAIL partners and on new published studies.

Throughout RESTRAIL, the toolbox was initially developed as a paper-based document. The paper document was later adapted into a short Practical guide which gives an overview of the tool (http://restrail.eu/IMG/pdf/restrail_book.pdf).

However, in WP6 the toolbox was developed not only on paper but also as a dedicated online workspace which is easier to disseminate, access and update (www.restrail.eu/toolbox). This is also important from a practical viewpoint, because the tool will be accessible directly on the field on wireless devices such as tablets or smartphones. The online Toolbox will be continuously updated, even after the end of the project, under the responsibility of the International Union of Railways.

The toolbox includes two parts. The former provides a ***general guidance***, namely a multistep approach for helping and structuring the analysis of a problematic situation. The question answered by the general guidance is *how to analyse a problem and choose the optimal preventative or mitigation measure(s)*? Consequently, this part of the toolbox may provide a general methodology for the inexperienced end-users who deal with a suicide or trespassing problem, as well as with post incident consequence mitigation difficulties. For the experienced end-users, it can be simply used as a checklist in the problem-solving process.

The latter part of the Toolbox includes the ***specific guidance*** which concerns details about the implementation of different preventative or mitigation measures. The question answered by the specific guidance is *how to implement the selected measure(s) in order to minimise the shortcomings and enhance the expected effect*? This part of the toolbox provides the end-user with a wide list of measures, implementation tips, examples, empirical evidence for effectiveness and other useful details which may be important during the implementation phase.

Fig. 4. RESTRAIL Practical guide (short paper version of the toolbox)

The specific guidance includes 70 different measures selected in the RESTRAIL. They are grouped in 25 families of measures sharing common typologies or common effect mechanisms to influence suicidal and trespassing behaviours. Each family may include an unequal number of specific measures which varies between 1 and 6. Some of the measures attempt to reduce the attractiveness of the railway as a means of suicide or for trespass, dissuading people from gaining access to the railway. Others attempt to move people away from high-risk locations through use of design at stations or railway crossings. Fences or barriers can be used in various ways (e.g. at stations and beyond stations) as a physical means of preventing access to the railway (for suicide and trespass). Some methods of prevention are designed to enable early interventions when a person is in a high risk area. Finally, some measures are introduced with the intention of mitigating the consequences of a collision. Overall, 21 families are dedicated to prevention and 4 families to mitigation of consequences. Among the preventative families, 8 are against suicide and trespass, 9 against suicide, and 4 against trespass.

For clarity and pragmatic purposes, the families are grouped in 3 broader categories according to their type and general mode of intervention:

1. *Organisational and procedural measures*. These are strategic, collaborative, enforcement and process related measures (e.g. risk assessment, collaboration between organisations, enforcement patrols, etc.) with cross-cutting effects on safety practice in general and on the following measures.
2. *Physical and technological measures*. These are measures related to engineering or technology such as fencing, landscaping, detection systems, lighting devices, etc.
3. *Public awareness and educational measures*. These measures improving the knowledge or skills of various categories of people (communication campaigns, signage, education in and outside schools, media guidelines, training and exercises, etc.).

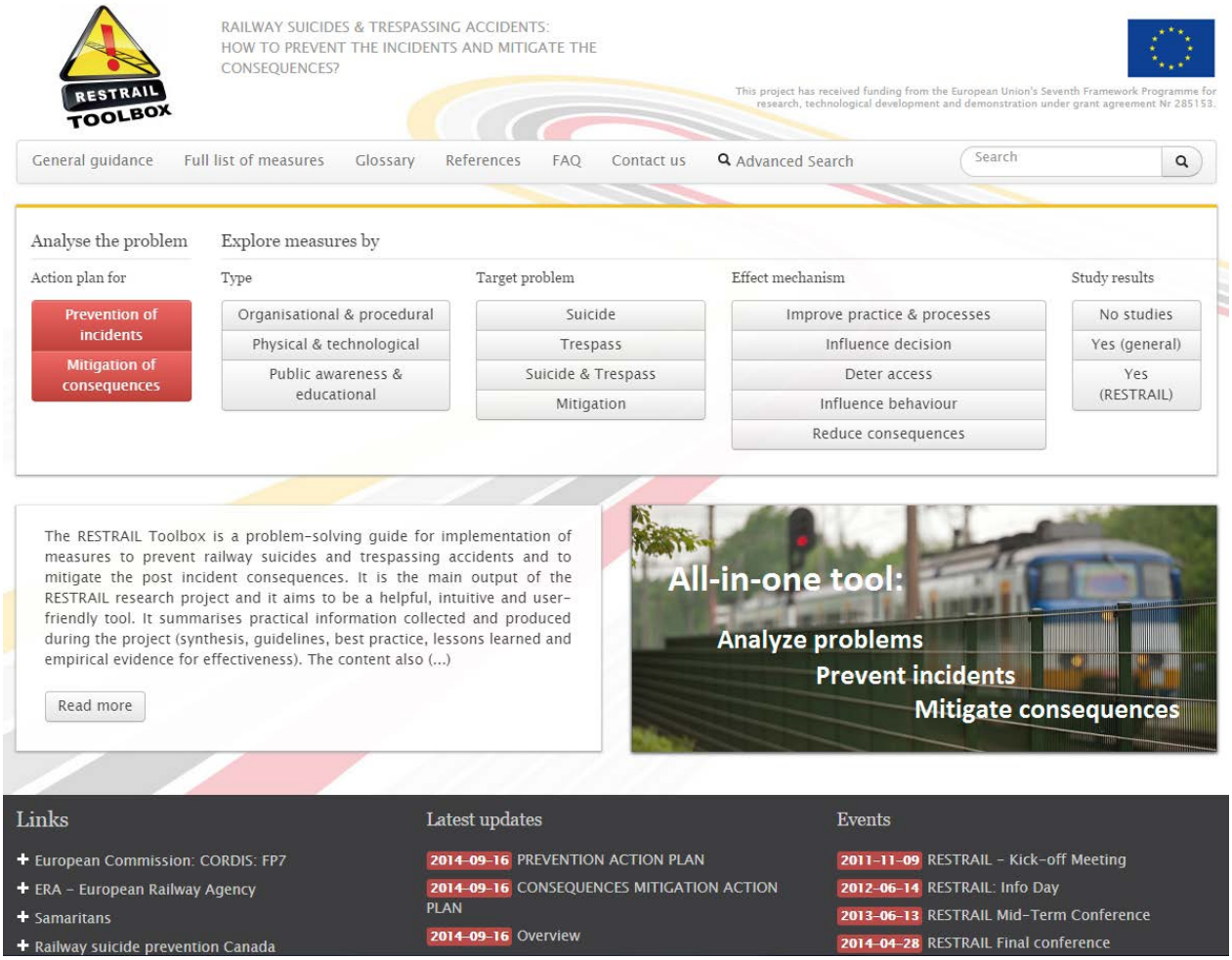

Fig. 5. RESTRAIL toolbox (online version)

In order to help decision-makers to evaluate and implement the safety measures more effectively, for each specific measure the content is displayed in a standard format which covers the following points: the name of the measure and a short description which included the aims of the measure; the measure profile (based on keywords); recommendations (best practice and lessons learned); warning points (expected difficulties and issues you should pay attention to); observations (other points you should not forget); study results (data or other evidence supporting the measure's effectiveness); gallery (with illustrations and examples).

The major advantage of the RESTRAIL Toolbox is that is includes a variety of evidence-based measures, which are organised in a user-friendly way in order to support the decision making process.

Through its complex content and functional organisation, the Toolbox meets the basic requirements of decision-makers which have been identified in the earlier stages of the RESTRAIL project:

- RUs and IMs would make decisions based on *a good understanding of the problem* they are facing in order to save as many lives as possible on the railway networks and maintain a high punctuality of the services.
- There may be different ways to approach the task of selecting the different preventative and post incident consequence mitigation measures. Therefore, any guidance or tools should be flexible, accounting for the fact that users may have *different levels of expertise or experience* in this area of work. The guidance and associated tools should therefore help the

end-user by *providing a structured approach* to solve the problem at hand and *provide clear options* to select an appropriate preventative measure. The expert may wish to short-cut some parts of the process and have *access to detailed data* that they may want to use in helping them to make their decision.

- The effectiveness of measures is another key issue for RUs and IMs. In other words the Cost-Benefit Analysis (CBA) for a measure needs to be positive in order for it to be considered for implementation. Therefore, the preventative and mitigation measures included in the toolbox are be based on a detailed assessment process and expert ratings on different evaluation criteria: (1) durability of effects, (2) costs and benefits (based on expert judgment and not on calculation of the C/B ratio), (3) integration with other policy measures, (4) impact on railway operations, (5) impact on people and jobs; (6) technological issues; (7) environment; (8) acceptance and (9) transferability issues. Total scores on the various evaluation criteria were computed for each measure separately in the context of suicide and of trespassing and only the measures which scored well have been recommended in the toolbox.

1.4 The potential impact, main dissemination activities and exploitation of results

1.4.1 Impact

Before RESTRAIL there was no integrated research in this topic: no solid state-of-the-art about railway suicide and trespass prevention, no clear classification of recommended or promising measures, only a few empirical evaluation of measures and just a few country-specific guidance materials. Even though a large number of measures had been proposed and used, there were no obvious conclusions on which measures are more effective or relevant for particular contexts. In addition, there were no available integrative classification systems of preventive measures against suicide and trespass, making it difficult to have a clear and global view of the cost-effective options.

Now everything is integrated and made available for the stakeholders. The RESTRAIL Toolbox overcomes this problem, giving an integrative overview of all possible measures pretested and organised in a single application guideline ready to be used in the future preventative interventions. Scientific research results are transformed in practical guidelines and methods, which can be used by infrastructure managers, station managers and railway undertakings in order to manage the impact of suicide and trespassing on the railways. The issues are considered in a broader legal and organisational context.

To our knowledge, the RESTRAIL Toolbox is the first guidance of this kind, with a great potential for development in the future. Therefore the project meets one of the key elements of FP7-projects, creating added value for RUs, IMs and station managers in operating their business but also for society by reducing the number of suicides and trespassers.

In this respect, the project has several major implications. The first one is on safety, by helping reduce the number of deaths and injuries. In other words, it directly contributes to the reduction of life loss and human suffering, thus improving community well-being.

The second implication is for the citizens who use the trains on a regular basis, for example for commuting. RESTRAIL helps reduce the traffic shut-down time after an incident improving the service punctuality. In this way, pedestrians and passengers will be less affected by traumatic events, will feel safer in the railway environment and will have a better perception of the train operating company.

The third implication concerns the railway industry, which is seriously affected by suicides and trespassing accidents, in terms of economic costs, stress among the train drivers and other railway staff, and negative public image. RESTRAIL helps the industry significantly reduce the direct and

indirect costs arising from these events and provides stakeholders with guidance on how to prevent and reduce post-traumatic stress.

Finally, there is a major impact for the scientific and research community interested in suicide and accident prevention. The project enabled an integrated collation of data, scientific publications, references, and study results which was difficult to grasp before RESTRAIL.

1.4.2 Dissemination activities

The most relevant dissemination activities and communication channels included:

- public and restricted deliverables
- scientific articles and conference proceedings in peer-reviewed international journals
- public website of the project and toolbox
- international and national presentations and workshops
- printed brochures and newsletters
- articles in the UIC e-news
- press releases

Printed brochures and newsletters

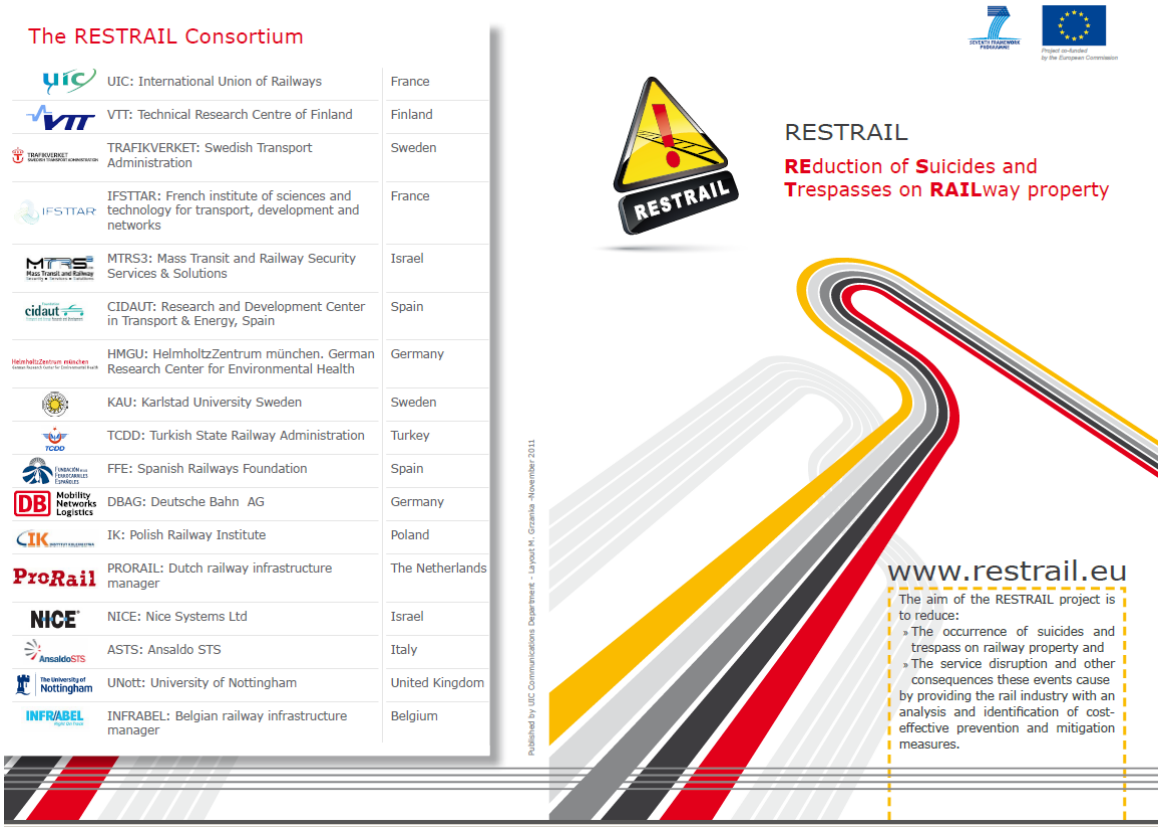

Fig. 6. RESTRAIL Brochure (cover page)

The three RESTRAIL newsletters disseminated the ongoing activities of RESTRAIL and informed the public about the key achievements.

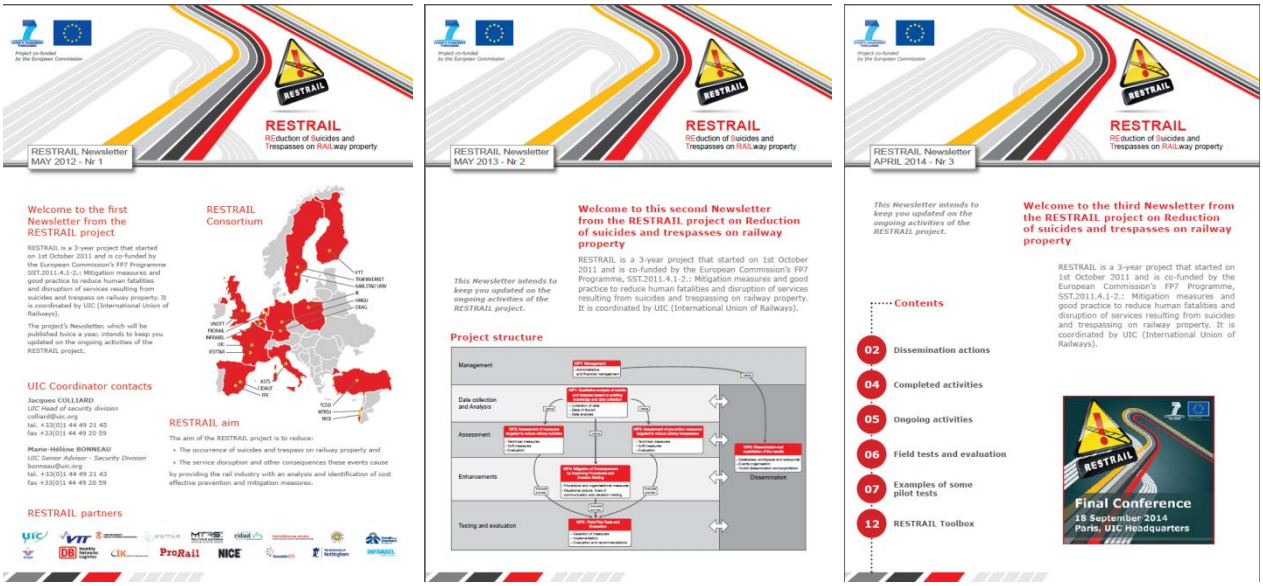

Fig. 7. The first, second and third RESTRAIL Newsletters

The different target-groups included:

- External experts of the advisory Group
- End-users: Decision makers from Rail companies: infrastructure managers and rail operators
- Scientific community
- Policy makers
- General public

Articles in the UIC e-News

Electronic newsletters were used as ideal medium to keep the Railway community informed about the project main results and key events. One UIC electronic newsletter (UIC e-News) about RESTRAIL activities was sent regularly to relevant stakeholders (railway undertakings, infrastructure managers, international bodies; more than 5000 addressees): 25 articles published during the whole period . Below some recent examples of articles:

E-News n° 390 issued in March 2014 (http://www.uic.org/com/uic-e-news/390/) advertised the RESTRAIL Toolbox and how it was disseminated at international level.

E-News n° 393 (http://www.uic.org/com/uic-e-news/393/) and n° 396 (http://www.uic.org/com/uic-e-news/396/) issued in April 2014 showed that the RESTRAIL toolbox was disseminated at EIM among infrastructure managers and among safety experts and scientific community at the Transport Research Arena 2014 conference through the presentation of two papers and the organization of one Invited Session. These were also the first dissemination actions to include the announcement of the Final Conference.

E-News n° 404 issued in June 2014 (http://www.uic.org/com/uic-e-news/404/) presented the main conclusions of the final RESTRAIL progress meeting and included the link to register for the Final conference.

E-News n° 408 issued in July 2014 (http://www.uic.org/com/uic-e-news/408/) showed that RESTRAIL project was disseminated at the International Congress of Applied Psychology through the two presentations and distribution of Newsletters.

E-News n° 414 issued in early September 2014 (http://www.uic.org/com/uic-e-news/414/) advertised for the Final conference and acted as a registration reminder.

E-News n° 416 issued on 26 September 2014 (http://www.uic.org/com/uic-e-news/416/) summarized the Final conference and the future exploitation of the project's results.

Press release

One day after the final conference UIC Communication Department issued a press release (N° 44/2014): http://www.uic.org/com/IMG/pdf/cp_restrail_final_en.pdf.

The UIC press articles generated subsequent press articles. One article was commissioned by DG Research. It was written by the communication company RETELL and published on 21 October 2014 the DG Research website and Horizon 2020 site under "success stories". This article communicates the important results of the project to the public and shows the taxpayers that their money is being well spent on excellent science and research and achieves results: http://ec.europa.eu/programmes/horizon2020/en/news/no-trespassing-preventing-rail-accidents-and-suicides

1.4.3 Exploitation of results and the way forward

Some of the RESTRAIL results are restricted to the project's consortium. However, the final and most important outcome of the project (the Toolbox) is open-access and available for free for the whole railway and scientific community. The public deliverables are available on the project's webpage www.restrail.eu and the RESTRAIL Practical Guide (i.e. short version of the Toolbox) is also downloadable from the website: http://www.restrail.eu/IMG/pdf/restrail_book.pdf Most importantly, the online toolbox is available at www.restrail.eu/toolbox.

The Toolbox will be easy to access, consult and update even after the end of the project. UIC takes responsibility for the future hosting, maintenance and regular update of the toolbox. In addition the RESTRAIL practical guide will be included in the UIC catalogue of publications.

The partners will continue to work together. We will try to organize periodic workshops so that current and future partners can share the most recent knowledge and best practice from their own countries.

Some ideas concerning possible follow-up research activities have been discussed during the final conference. The classification system used in this tool is flexible enough to allow new measures to be added in the future or to include new safety issues such as preventing accidents at level crossings.

Furthermore, new and more elaborated field tests could be initiated. The most promising measures could be selected and evaluated in longer life trials (e.g. implementation on large scale and during longer time). Scale and time should be enough to collect more reliable data and detect effect statistically. The implementation of measures in the safety management system and collaboration outside the direct railway vicinity to influence suicide persons at an earlier stage, could be additional strategies to exploit the results of the project.

As revealed in the previous working steps in RESTRAIL, a high amount of data and evidence are still unavailable or difficult to obtain, thus requiring developing relevant indicators from the field,

collection procedure and tools at a wider scale than it was expected to do in the RESTRAIL context. A further step will thus be verifying and sometimes modifying the assumptions which base this theory-based framework. It would probably involve to carrying out new studies and investigation whenever needed. The recently proposed model of suicide and trespass process (Burkhardt, Rådbo, Silla and Paran, 2014) and the updated knowledge in the RESTRAIL toolbox could provide the basis for initiating such a theory-based approach for evaluating RESTRAIL measures

1.5 The address of the project public website as well as relevant contact details

UIC created a dedicated website at the very beginning of the RESTRAIL project (www.restrail.eu) which gives the visitor a comprehensive overview of the project.

The RESTRAIL website was regularly updated and maintained in order to reflect the project developments. All the news and public outcomes were published on the webpage.

The website will remain online after the end of the project.

Fig. 8. RESTRAIL Website – Home page

2. USE AND DISSEMINATION OF FOREGROUND

2.1 List of scientific publications

LIST OF SCIENTIFIC (PEER REVIEWED) PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES										
NO.	Title	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Year of publication	Relevant pages	Permanent identifiers[1] (if available)	Is/Will open access[2] provided to this publication?
1	*Stable time patterns of railway suicides in Germany: comparative analysis of 7,187 cases across two observation periods (1995-1998; 2005-2008)*	*Lukaschek, Karoline*	*BMC Public Health*	*14:124*	*BioMed Central*	*UK*	*2014*		*DOI: 10.1186/1471-2458-14-124*	*Yes*
2	*Determinants of completed railway suicides by psychiatric in-patients: case-control study*	*Lukaschek, Karoline*	*The British Journal of Psychiatry*	*205*	*The Royal College of Psychiatrists*	*UK*	*2014*	*398 – 406*	*DOI: 10.1192/bjp.bp.113.139352*	*No*

[1] A permanent identifier should be a persistent link to the published version full text if open access or abstract if article is pay per view) or to the final manuscript accepted for publication (link to article in repository).

[2] Open Access is defined as free of charge access for anyone via Internet. Please answer "yes" if the open access to the publication is already established and also if the embargo period for open access is not yet over but you intend to establish open access afterwards.

3	*Reducing suicide and trespass in rail*	*Ryan, Brendan*	*Journal of Rail and Rapid Transit (Part F of the Proceedings of the IMechE)*	*227(6)*	*Sage Journals*	*UK*	*2013*	*714 – 722*	*DOI: 10.1177/0954409713497200*	*Yes*
4	*Safety and security in rail systems: Drawing knowledge from the prevention of railway suicide and trespass to inform security interventions,*	*Ryan, Brendan*	*In Counter-Terrorism and Hostile Intent: Human Factors Theory and Application, ed Alex Stedmon, Glyn Lawson, Rose Saikayasit*	*In press*	*Ashgate Publishing*	*UK*	*2014*			*No*
5	*A systematic review of the literature on safety measures to prevent railway suicides and trespassing accidents*	*Havârneanu, Grigore*	*Accident Analysis and Prevention*	*Revision under review*	*Elsevier*	*UK*	*2015*			*No*
6	*Preventing railway suicide and trespass: A toolbox for evaluation and implementation of measures*	*Havârneanu, Grigore*	*Paper presented at the Global level crossing safety & trespass prevention symposium*	*In press*	*GLXS 2014*	*USA*	*2014*	*1-6*	*http://railtec.illinois.edu/GLXS/presentations.php*	*Yes*

7	RESTRAIL: Collaborative Project on REduction of Suicides and Trespasses on RAILway property	Bonneau, M.-H.	*Paper presented at Transport Research Arena Conference*	N/A	*TRA 2014*	Paris, France	2014	1-10	*http://www.traconference.eu/papers/pdfs/TRA2014_Fpaper_18106.pdf*	Yes
8	*How to prevent suicide and trespass on the railways and mitigate the consequences? Practical guide*	Bonneau, M.-H	Final RESTRAIL dissemination book	N/A	UIC	Paris, France	2014	1-44	*http://www.restrail.eu/IMG/pdf/restrail_book.pdf*	Yes
9	*"RESTRAIL project: Reduction of Suicides and Trespass on RAILway property"*	*Colliard, Jacques*	*European Railway Review*		*Russell Publishing Ltd*		2013			Yes
10	*Developing methodology in RESTRAIL for the preliminary evaluation of preventative measures for railway suicide and trespass*	*Ryan, Brendan*	*Proceedings of the Rail Human Factors Conference*		*Taylor and Francis*	*London, UK*	2013	*89-98*		No
11	*Reducing suicide and trespass in rail*	*Ryan, Brendan*	*Paper presented at the Royal Society, RRUKA Annual Conference*		*Rail Research UK-A*	*London, UK*	2012		*http://rruka.org.uk/wp-content/uploads/2012/11/Brendan-Ryan-University-of-Nottingham.pdf*	
12	*Interview*	*Van der Veer, Angela*	*Proloog*		*PRORAIL Internal magazine*		2013			
13	*RESTRAIL project: Reduction of Suicides and Trespass on RAILway property"*	*Táuler, A.*	*Actas del X Congreso de Ingeniería del Transporte-CIT*			*Granada*	*2012*			

14	*Movilidad, accidentalidad y comportamientos sociales. Suicidios y arrollamientos en un escenario de transporte: el ferrocarril*	*Sacristán, M.*	*Actas de las II Jornadas de Sociología de la AMS*			*Madrid*	2012			

2.2 List of dissemination activities

LIST OF DISSEMINATION ACTIVITIES								
NO.	Type of activities[3]	Main leader	Title	Date/Period	Place	Type of audience[4]	Size of audience	Countries addressed
1	UIC Meeting	UIC	UIC Security platform - Steering Committee	30 Nov. 2011	Bratislava	Railways security experts	25	worldwide
2	UIC Exhibition	UIC	UIC Info day - Safety and Security stand	07 Dec. 2011	Paris, UIC	Railways (General Assembly of UIC)	150	worldwide
3	UNECE Conference	UIC	UNECE / OSCE - Transport Security Round Table	12-13 Dec. 2011	Vienna	Authorities	80	worldwide
4	Spanish Event	FFE	BCNRail 2011 - International Industry Railway Show	Dec. 2011	Barcelona	Rail sector		worldwide
5	UIC Meeting	UIC	UIC Security platform - Steering Committee	5 March 2012	Berlin	railways - security experts	25	Worldwide

[3] A drop down list allows choosing the dissemination activity: publications, conferences, workshops, web, press releases, flyers, articles published in the popular press, videos, media briefings, presentations, exhibitions, thesis, interviews, films, TV clips, posters, Other.

[4] A drop down list allows choosing the type of public: Scientific Community (higher education, Research), Industry, Civil Society, Policy makers, Medias, Other ('multiple choices' is possible).

6	Swedish Conference	TRAFIKVERKET	National Safety Conference of TRAFIKVERKET	13-14 March 2012	Orebro, Sweden	Rail and Authorities		Sweden
7	Two day event	PRORAIL	Leadership course high potentials railway sector	April 2012	Utrecht	Railway sector	30	Netherlands
8	EU Conference	UIC	TRA 2012 : Transport Research Arena 2012	23-26 April 2012	Athens, Greece	Transport sector, EC	1000	European
9	Symposium	PRORAIL	Symposium 'Suïcide leeft" (suicide lives) Nijmegen	24 April 2012	Nijmegen	Health sector	1000	Netherlands
10	Symposium	PRORAIL	Symposium "Richtlijn suicidal gedrag" (guideline suicidal behaviour)	22 May 2012	Amersfoort	Health sector	1000	Netherlands
11	Congress	FFE / ANSALDO	INNOTRANS 2012	17-21 Sept. 2012	Berlin	Rail sector		Worldwide
12	Conference	UIC / VTT	12th Global Level Crossing and Trespass Symposium and 22nd International Railway Safety Conference	07-12 Oct. 2012	London	Rail and road safety experts	500	Worldwide
13	UIC Annual meeting	UIC	UIC Safety platform core group and plenary	11 Oct. 2012	London	railways - safety experts	50	European
13	Congress	HMGU	World Psychiatric Association	17-21 Oct. 2012	Prague	Scientific community	1700	Worldwide

			International Congress					
14	UIC Annual congress: workshop and conference	UIC / UNOTT/MTRS	UIC Security platform - 8th annual congress	24-26 Oct. 2012	Bratislava	rail security sector	200	Worldwide
15	Conference	UNOTT	RRUK-A Annual Conference	7 Nov. 2012	London	Scientific community, rail sector	170	UK
16	Meeting	UIC	UNECE Working Party on Rail Transport (SC.2)	8 Nov. 2012	Geneva	Rail Transport authorities	60	European
17	Conference	UIC	57th COLPOFER Conference	9 Nov. 2012	Paris	rail security experts + police representative	60	European
18	Workshop	PRORAIL	Workshop for the development of a training for suicidal contact (1)	14 Nov. 2012	Utrecht	Railway sector, Health sector, Police, Social sciences	20	Netherlands
19	Meeting	PRORAIL	Meeting with spokespeople NS & ProRail	29 Nov. 2012	Utrecht	Railway sector	10	Netherlands
20	Seminar	PRORAIL	Belgian seminary suicide prevention	6 Dec. 2012	Brussels	Railway sector, police	250	Belgium, Netherlands
21	Forum	UIC	ELCF – European Level crossing forum – plenary meeting	24 Jan. 2013	Utrecht	Rail and highway safety professionals	50	European
22	Workshop	PRORAIL	Workshop for the development of a training for suicidal contact (2)	30 Jan. 2013	Utrecht	Railway sector, Health sector, Police, Social sciences	20	Netherlands, UK, Belgium
23	Workshop	DBAG	DB Security Board	26 Feb. 2013		Rail Security experts	20	National (Germany)
24	Conference	UNOTT/ IFSTTAR/ UIC	Fourth	05-07 March 2013	London	Scientific	180	Europe

			International Rail Human Factors Conference			community rail sector		
25	International Fair	TCDD	Eurasia Fair	7-9 March 2013	Istanbul	University Industry, Civil Society, media.	300 part. 18 000 visitors.	Worldwide
26	Swedish Conference	TRAFIKVERKET	National Safety Conference of TRAFIKVERKET	13-14 March 2013	Orebro, Sweden	Rail and Authority	200	National (Sweden)
27	International conference	UIC	International seminar on railway safety and security	10-12 April 2013	Tanger (Morroco)	Rail and Authority	200	Worldwide
28	Meeting	ProRail	National meeting crisis managers OCCR (Operational Control Center Rail)	10 April 2013	Utrecht	Rail	50	National (Netherlands)
29	Sessions	ProRail	Pilot and information sessions gatekeeper courses	May, June 2013	Utrecht/Amsterdam	Rail, Police, Government	40	National (Netherlands)
30	Education session	ProRail	Education session	May 2013	Utrecht	School of Journalism, Rail	200	National (Netherlands)
31	Meeting	ProRail	Meeting	28 May 2013	The Hague	Government, Ministries, Mental Health-oriented organisations	15	National (Netherlands)
32	Board meeting	HMGU	Annual board meeting of the train drivers' union	26th June 2013	Dortmund	officials, train drivers		National (Germany)
33	Congress	HMGU/UNOTT	European association of	4-6 July 2013	Cambridge, UK	Scientific community		Worldwide

			psychosomatic medicine					
34	Conference	ProRail	International association for suicide prevention	24-28 Sept. 2013	Oslo	Scientific community and Rail		Worldwide
35	Congress	HMGU and KAU	International association for suicide prevention	24-28 Sept. 2013	Oslo	Scientific community		Worldwide
36	Conference	Trafikverket and KAU	International Railway Safety Conference	7-12 October 2013	Vancouver, Canada	Railway Safety		Worldwide
37	Meeting	ProRail	Meeting National Agenda Suicide Prevention	17 Oct. 2013	The Hague	Government, Ministries, Mental Health-oriented organisations	15	National (Netherlands)
38	Working group	UIC and IFSTTAR	Working group on suicide prevention organized by the French Ministry of Health.	5 Nov. 2013	Paris	Rail, Public Transport, and Public health authorities	10	National (France)
39	Congress	UIC	UIC World congress on security	13-14 Nov.2013	Paris	Rail and authorities	200	Worldwide
40	Conference	UNOTT	Transport Security Expo and Conference - London, 2013	13-14 Nov.2013	London	Public Transport Security		Worldwide
41	International event	FFE	BCNRail 2013 - International Industry Railway Show	19-21 Nov. 2013	Barcelona	Rail sector		Worldwide
42	National event	ProRail	Challenge Suicide prevention	3,4, 5 Dec. 2013	Utrecht	Science, Experts, Rail		National (Netherlands)

43	National event	INFRABEL/UIC / PRORAIL	INFRABEL national seminar	19 Dec. 2013	Brussels	Rail and suicide experts	60	National (Belgium)
44	Education session	ProRail	Education session	Feb/Mar/May 2014 (27 Feb, 6 Mar, 21 May	Utrecht	School of Journalism, Rail	200	National (Netherlands)
45	Conference	Trafikver-ket / UIC	Swedish Railway safety conference	12-13 March 2014	Örebro, Sweden	Public transport sector		National (Sweden)
46	Workshop	UIC/PRORAIL	EIM Workshop	3 April 2014	Brussels	Rail infrastructure managers	20	Europe
47	EU Conference	UIC/ IFSTTAR/ VTT	TRA 2014	14-17 April	Paris	Transport sector, EC	1000	Europe
48	Colpofer Conference	UIC	Colpofer 60th conference	06-07 May 2014	Cracow, Poland	Rail security and rail police representatives	60	Europe
49	Conference	UNOTT	Engineering Faculty Research Showcase, University of Nottingham	8 May 2014	Nottingham, UK	Education	40	National (UK)
50	Collaboration group	TRAFIKVERKET	Suicide meeting lead by Rescue service.	16 May 2014	Stockholm, Sweden	Rescue service		National (Sweden)
51	Working group	UNOTT	National Suicide Prevention working group (NSPWG)	21 May 2014	London, UK	Rail Industry	30	National (UK)
52	Conference	TRAFIKVERKET	Suicide and suicide prevention conference in. May 26, 2014	26 may 2014	Nyköping Sweden			National (Sweden)
53	Congress	UIC	28th International	8-13 July 2014	Paris	Scientific		Worldwide

			Congress of Applied Psychology: ICAP			community		
54	Symposium	VTT	GLXS 2014	3-8 Aug. 2014	University of Illinois, U.S.	Rail and scientific community	300	Worldwide
55	Conference	VTT	Finnish Transport Infrastructure Conference	27–28 Aug. 2014	Tampere, Finland	Transportation experts	600	National (Finland)
56	Workshop	TCDD	TCDD Workshop	09 Sept. 2014	TURKEY	Public transport sector		National (Turkey)
57	Press Conference	VTT	Press conference organised by the Finnish Transport Safety Agency	10 Sept. 2014	Tampere, Finland	Journalists	15	National (Finland)
58	Meeting	VTT	Meeting at the Finnish Transport Administration	10 sept. 2014		Public transport sector	15	National (Finland)
59	Seminar	HMGU	Railway suicide: a severe crisis in life	13 Sept 2014	Düsseldorf, Germany	Family, friends and witnesses of railway suicides	80	National (Germany)
60	congress	HMGU	Congress of the German Society for Suicide prevention (DGS)	19.-21. Sept 2014	Cologne, Germany	Scientific community	300	National (Germany)
61	Conference	TRAFIKVERKET/KAU/UIC	24th International Railway Safety Council (IRSC)	12-17 Oct. 2014	Berlin, Germany	Rail Safety community	200	International
62	Conference	UNOTT	Rail Research	5 Nov.	London	Rail Research		National (UK)

			UK – RRUK conference, London					
63	Working group	UIC	Plenary meeting of the European Level crossing Forum (ELCF) and International Level Crossing Awareness Day (ILCAD) 2014/2015 meeting	13-14 Nov. 2014	Rome, Italy	Rail and scientific community	120	Europe
64	Congress	UIC	10th World security congress	24-26 Nov.2014	Lisbon, Portugal	Rail security	200	Worldwide
65	Workshop	UIC	Workshop on the RESTRAIL Toolbox organised by Trafikverket	2 Dec. 2014	Stockholm, Sweden	Rail and public transport sector	35	National (Sweden)