

SUMMARY OF THE PRIMARY RESEARCH FOCUS AND CONTRIBUTIONS TO RAIL INDUSTRY

This document briefly presents my major contribution to the RESTRAIL project. It provides an overview of the *RESTRAIL Toolbox*, specifically its background, its aim, its development process, its content and structure and its implications for the railway industry.

1. Why suicides and trespassing accidents are a major concern for the railways

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 more than 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). In short, railway suicides and trespassing accidents are highly probable events with high impact on society and rail industry.

2. The lack of systematic evidence about countermeasures and the relevance of RESTRAIL

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, RESTRAIL (www.restrail.eu), a 3-year European Union FP7 project aims to tackle these important issues. One major objective of RESTRAIL is to provide guidance about the implementation of preventative and mitigation measures against railway suicides and trespassing accidents and to disseminate this information among the end-users for a better exploitation of the results of the project.

3. Why the rail industry needs a Toolbox for the evaluation and implementation of measures

The rail industry needs practical outcomes from 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.

4. What is the Toolbox and how to use it

The RESTRAIL Toolbox meets these 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 is a guide to best practice which summarises the most relevant practical and scientific information collected during the project (Bonneau, Colliard, & Havârneanu, 2014). 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 aims of the RESTRAIL Toolbox are threefold: (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.

5. How the toolbox has been developed

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 has been developed as a paper-based document. However, the toolbox is currently being organised in a dedicated online workspace which will be 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.

6. Organisation of the toolbox content

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.

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.).

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).

7. Implications for the end-users and rail industry

The major advantage of the RESTRAIL Toolbox is that it 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 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.

8. Conclusion about the primary research focus and its added value

Before RESTRAIL, 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.

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.

9. References

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