RESTRAIL

REduction of Suicides and Trespasses on RAILway property

Collaborative project

Method for the evaluation of measures targeted to prevent railway suicides and trespassing accidents

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1. EXECUTIVE SUMMARY

This document describes the method that is used in the evaluation of preventative measures targeted to reduce railway suicides and trespassing accidents in the RESTRAIL project. The purpose of the evaluation is to identify measures that can effectively reduce suicides and trespassing accidents that are cost effective, and have no shortcomings that could significantly impede implementation.

Requirements for the evaluation method

The development of the evaluation method was based on a number of general requirements, i.e. the method should:

- be based on a clear and comprehensive description of the measure to be evaluated
- be applicable to all kinds of existing and planned preventive measures
- be transparent in the sense that all phases of the evaluation process are clearly described and easy to understand
- be based on facts as far as possible but allow also for expert judgement when facts are not available
- provide an estimate of the expected effect of the measure on the frequency of suicides and trespassing accidents on railways
- provide estimates of implementation and maintenance costs of the measure
- be able to take into account all relevant effects of the measure (e.g. on running of trains, people and jobs, and environment)
- take into account issues concerning transferability of measures (e.g. from one country to another, or from small to large scale implementation)
- enable the use of different weights for the various impacts when determining the overall feasibility
- ensure, as far as is practicable, that if two different evaluators evaluate the same measure using the same criteria and methodology, then the outcome shall be the same.

Evaluation process

The evaluation process consists of a number of stages starting from preliminary evaluation and ending in the documentation of results (Figure E-1).

Information on the preventative measures to be evaluated was first collected by a questionnaire survey to RESTRAIL partners in work package 1. Preventative measures were discussed at a number of meetings of the evaluation teams in the early stages of the process. This included exercises to classify and carry out a first screening of the measures, arranging these into categories of similar measures, in preparation for detailed evaluation in later stages of the process by evaluation teams consisting of work package 2 and 3 personnel.

Additional information concerning the application of the measures is requested from those who provided the original description of the measure, usually from RESTRAIL partners in countries where the measure in question has been implemented or planned. Detailed information on the measures is collected on specific evaluation forms (see Annex 2), using a number of evaluation criteria as prompts for the collection of additional information (one form for each measure).The RESTRAIL partners may also contact national experts to help in the provision of the requested information.

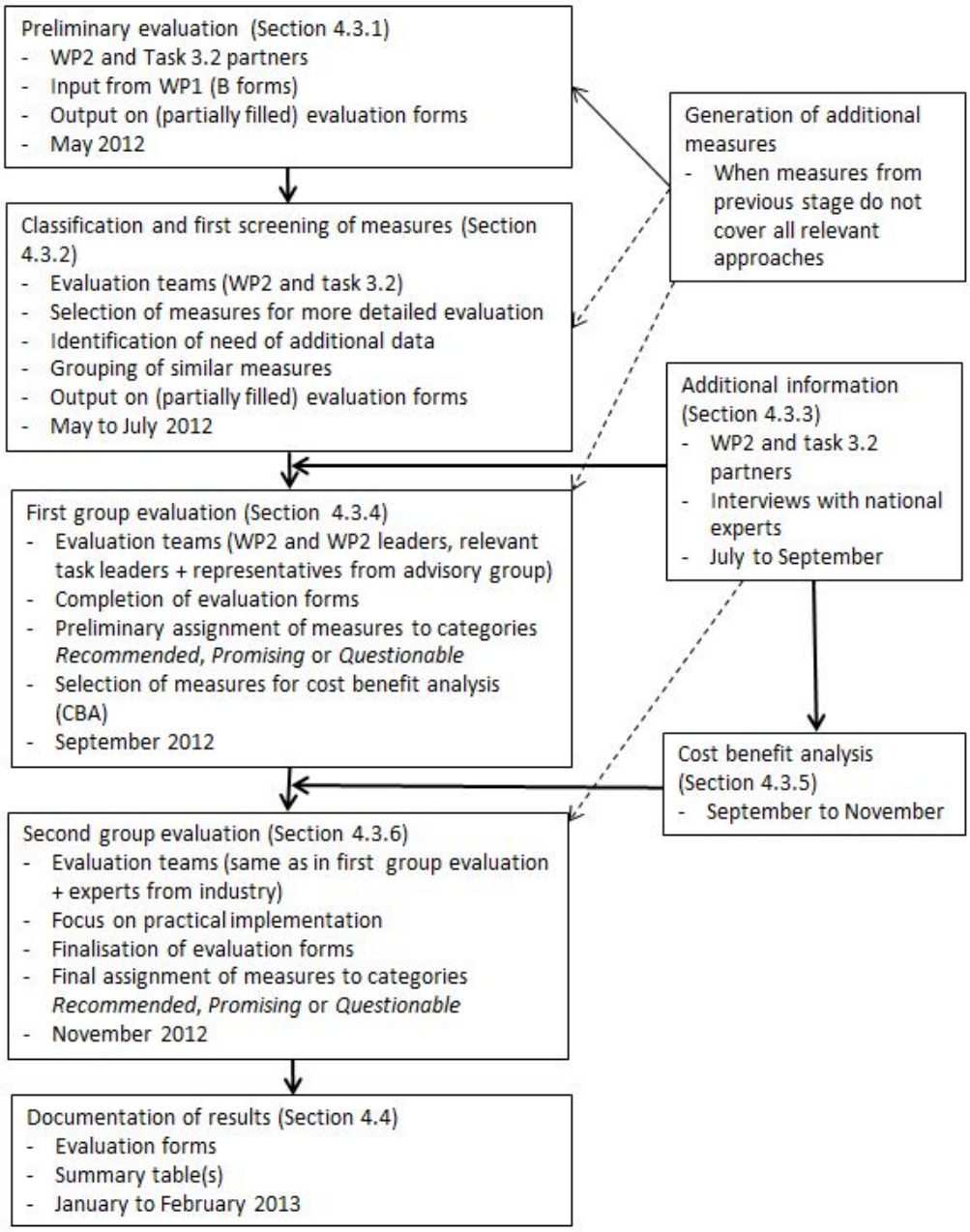

Figure E-1. Overview of the evaluation process.

At the first group evaluation the data on completed evaluation forms are reviewed and supplemented with additional data where necessary. Through discussion of the content of the forms (i.e. the performance of the measures against each of the evaluation criteria) the measures are assigned to categories *recommended*, *promising* or *questionable*. The most promising measures are selected for cost benefit analysis.

At the second group analysis, where experts from the industry participate, focus is in the practical implementation of the measures. The information and evaluations on the forms are reviewed and finalised. The output from this stage completes the actual evaluation and the results are saved on the evaluation forms, one form for each measure.

Finally, the results of the evaluation process are documented. This documentation includes a brief overview of the evaluation process, summarises the results of the evaluation, and contains the evaluation form in the annex. Some additional work will be carried out by partners in separate

tasks within WP2 and WP3 to complete additional review and evaluation of soft measures for prevention of suicide (task 2.3), and the development of new soft measures for prevention of trespass (task 3.3). These partners will contribute where necessary to the general evaluation of the broad range of preventative measures that has been described in this deliverable, and will take relevant findings from this evaluation to inform other activities as part of the work in tasks 2.3 and 3.3.

Evaluation criteria

The evaluation of measures is based on the use of the following 14 criteria:

Description of the measure provides a description of relevant features of the measure.

Definition of target incidents describes the kinds of incidents the measure is intended to reduce. It refers to specific type of incidents, but can focus on a specific group of people, e.g. school children

Size of the problem provides a quantitative estimate of the frequency of target incidents (e.g. trespassing accidents in the target group per year).

Effect on incidents means the expected effect (in per cent) on target incidents (as defined above). The effect in absolute number of incidents can then be calculated by multiplying this estimate by "size of the problem".

Durability of effects concern the durability of the effects on target incidents: are they likely to remain fairly stable or is there reason to believe that they will erode with time.

Costs and benefits should provide approximate estimates of the costs and benefits, if available. A more detailed cost benefit analysis will be conducted for a limited number of most promising measures that will be identified in the first group evaluation.

Integration with other policy measures describes how the measure is integrated with other preventative measures or interventions.

Impact on railway operations means the positive or negative effect on the running of trains.

Impact on people and jobs means especially the effects on the health and jobs of people within railway industry (e.g. the number of staff in different job categories and changes in the roles of people) but also elsewhere if relevant.

Technological issues concern changes in the existing technology and infrastructure caused by the implementation of the measure, including the readiness of technology for new interventions.

Environmental issues concern impacts on the environment in general, e.g. different kinds of pollution, impacts on scenery and wildlife).

Acceptance provides an estimate of how well the measure is accepted by the public and relevant stakeholders (e.g. policy makers, industry).

Transferability issues concern the functionality of the measure in different environments and in different scales, e.g. is it likely that the effects are different in different countries or depend of the scale of the implementation.

Additional information can be any relevant information that is not dealt within the issues listed above, e.g. notes on the strengths, weaknesses, opportunities and threats concerning the conducted evaluations.

Guidelines for evaluation

Guidelines are provided in section 5.2.2 for the collection of information on the above mentioned issues (criteria) and the evaluation of measures based on these criteria. A scoring system is used (2, 1 or 0 - from better to worse), to describe how well the measure in questions fulfils each criterion. Verbal descriptions of these scores are provided on the form, and they vary between criteria. These scores are useful in providing a quick overview of the properties of all measures together. They are used only as a guide to assign measures into categories *recommended*, *promising* or *questionable*. This final categorisation is decided by the evaluation team at the second group evaluation meeting, based on the following suggestions:

Measures in the category *Recommended* should, for example

- have a large group of target incidents or have a large impact on target incidents or both
- produce benefits that are larger than costs
- should not have significant negative impacts on railway operations or people and jobs in the railway industry
- not have major obstacles to integration into existing infrastructure and other policy measures.

Measures in the category *Promising* could, for example

- have technical implementation or maintenance problems that could be solved in near future
- have less than desirable effects on target incidents, but the effect could be significantly increased by improved design and implementation
- be too expensive at present, but there are new methods or tools in sight that could significantly reduce the cost.

Measures in the category *Questionable* could, for example

- have very small target group or very small impact on incidents, or both
- be very expensive compared to the benefits
- have significant negative impacts e.g. on railway operations, people and jobs or the environment
- have major obstacles to integration into existing infrastructure and other policy measures
- have been designed to fit specific environments and situations that are not likely to exist elsewhere or are likely to disappear in near future.

2. INTRODUCTION

2.1 Background

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.

In work package 1 of the RESTRAIL project, statistical and behavioural data concerning railway suicide and trespasses are collected and analysed. Output from work package 1 includes a preliminary list of measures for the prevention of railway suicides and trespassing. The potential measures for the prevention of suicides and trespassing on railways are evaluated in work packages 2 and 3 of the project, respectively. The main aim of the evaluation is to provide a systematic and rational basis for further testing of selected measures and the development of recommendations concerning the prevention of trespassing accidents and suicides in work package 5 of the project.

WP2 aims to identify and provide an evaluation of the measures to prevent suicide against a range of criteria which consider different aspects of success of the measure. This analysis includes consideration of the conditions of success in terms of suicide prevention on the European and the whole world's rail network, taking into account regional/national differences, locations and hot-spots and level crossings, etc.

WP3 is dedicated to analyse the best practices (technological and non-technological) and to identify the cost-efficient measures to prevent railway trespassing accidents. One of the main tasks focus on the evaluation of identified countermeasures (technical and soft measures) for preventing trespasses, taking into account the research findings and good practices by railway undertakings (RU) and infrastructure managers (IM).

After developing the methodologies for evaluating technical and soft measures, those methodologies will be applied to each type of measure with the aim of finding the best measures (in terms of cost-effectiveness criteria) to be trialled later in the pilot tests during WP5. Particular attention will be given to the development of new approach of soft measures to avoid trespassing accidents. The aim is to develop recommendations and guidelines for mitigation measures to reduce human fatalities and disruption of services resulting from trespasses and suicides on railways property.

Due to the very close similarity of the issues, available data and evaluation methodologies, the most effective way to carry out the evaluation is to merge aspects of the work in WP2 and WP3. The aim of this document is therefore to develop a common approach and framework for measures dealing with suicides (WP2) and trespasses (WP3). This is why the present document develops a methodology which will be common to both work packages.

2.2 Purpose of the document

This document describes the method that is used in the RESTRAIL project in the evaluation of preventative measures targeted to reduce railway suicides and trespassing accidents.

2.3 Definitions and acronyms

Term	Meaning
Suicide	Suicide is an act to deliberately injure oneself resulting in death, as recorded and classified by the competent national authority.
Trespassing accident	Accidents resulting in injuries to unauthorised persons on railway premises who are hit by a railway vehicle or by other object attached to or has become detached from the vehicle, including electrocution related to rolling stock in motion.
Incident	Either trespassing accidents or suicides or both, depending on context
Evaluation criteria	A list of 14 criteria in this project, which are used as the basis for determining the likely the success of known preventative measures for railway suicide and trespass
Preventative measures	Known interventions or initiatives that are used in countries across Europe, which attempt to minimise incidents of suicide or trespass. These measures may take the form of different modes of operation, such as physical barriers to prevent or inhibit access to the track, or other interventions to influence the behaviours of people who might access track areas.

Acronym	Meaning
CBA	Cost-benefit analysis
DoW	Description of Work (document describing e.g. the objectives, methods and output from the RESTRAIL project)
SWOT	Strengths, weaknesses, opportunities, threats

3. GENERAL REQUIREMENTS FOR THE EVALUATION METHOD

The basic requirement for the evaluation method is that it should be able to discriminate between measures that are likely to reduce suicide and trespassing on railways in a cost-effective way and measures that are less likely to succeed in this respect. The results of the evaluation should provide a firm basis for the judgement of whether the implementation of a particular measure in different countries and environments is feasible. Therefore the evaluation method should be able to take into account all relevant impacts of the measures. Consequently, the evaluation method should[1]:

- be based on a clear and comprehensive description of the measure to be evaluated
- be applicable to all kinds of existing and planned preventive measures and combinations of such measures
- be transparent in the sense that all phases of the evaluation process are clearly described and easy to understand
- be based on facts as far as possible but allow also for expert judgement when facts are not available (but it should be made clear when evaluation is based on subjective evaluation in contrast to factual knowledge)
- provide an estimate of the expected effect of the measure on the frequency of suicides and trespassing accidents on railways
- provide estimates of implementation and maintenance costs of the measure
- be able to take into account all relevant effects of the measure (e.g. on running of trains, people and jobs, and environment)
- take into account issues concerning transferability of measures (e.g. from one country to another, or from small to large scale implementation)
- enable the use of different weights for the various impacts when determining the overall feasibility.
- ensure, as far as is practicable, that if two different evaluators evaluate the same measure using the same criteria and methodology, then the outcome shall be the same.

The evaluation criteria were developed based on these requirements.

[1] The requirements and the method described in the following are largely based on an unpublished paper "Development of criteria for identifying best practice in road safety and collecting information on the use of best practice road safety measures", prepared by Rune Elvik for the SUPREME project (http://www.kfv.at/index.php?id=711). The SUPREME method is also described in Part A of the Final Report of SUPREME (http://ec.europa.eu/transport/roadsafety_library/publications/supreme_a_methodology.pdf)

4. EVALUATION PROCESS

4.1 Overview of evaluation process

The evaluation will be carried out in a number of stages as presented in Figure 1. The input into the evaluation process (i.e. the measures to be evaluated and the types of data needed) is described in subsection 4.2, the stages of the evaluation process are described in subsection 4.3, and the documentation of results in subsection 4.4. The evaluation criteria and guidelines for their application are described in section 5.

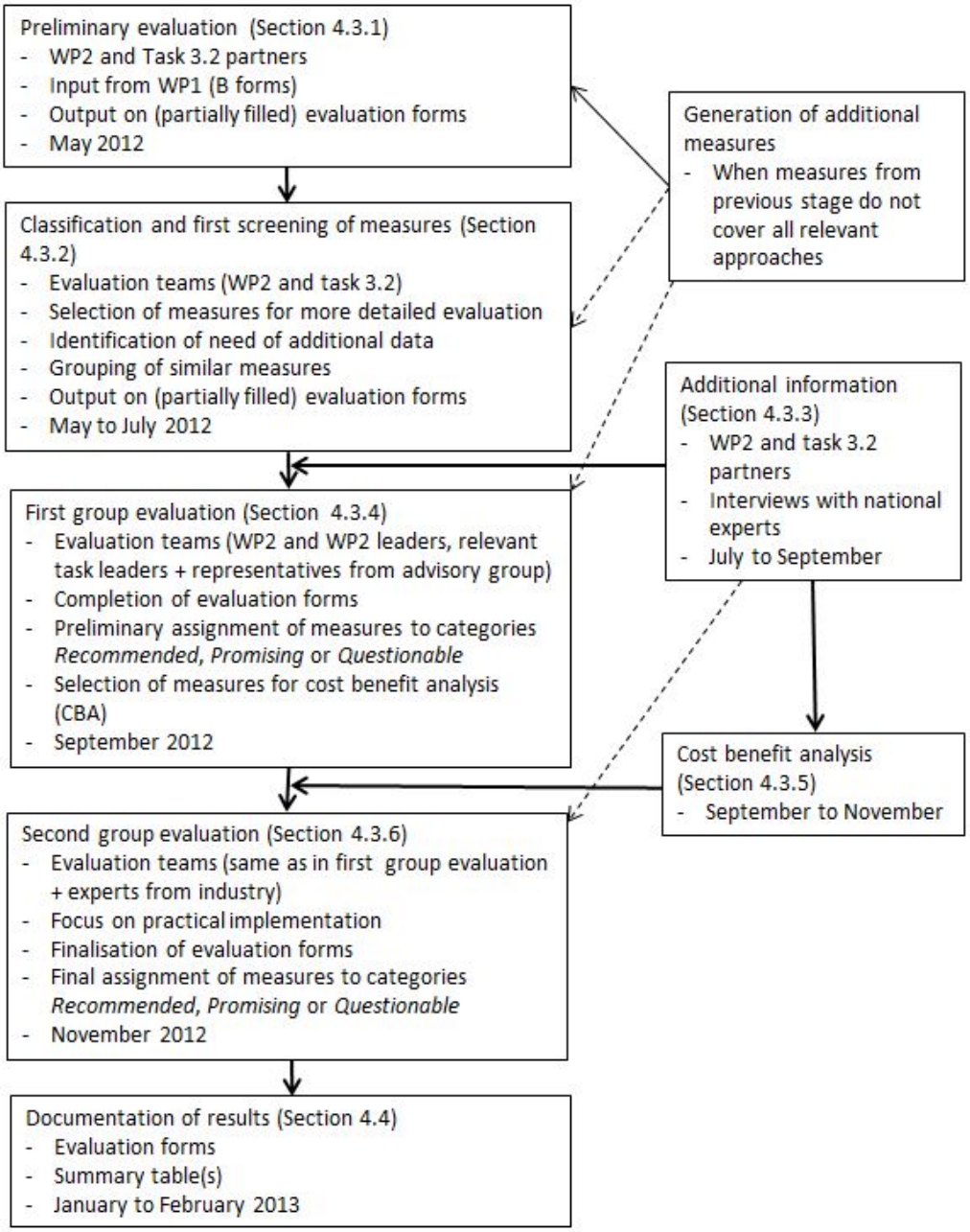

Figure 1. Overview of the evaluation process.

4.2 Measures to be evaluated

4.2.1 Input into evaluation process

An initial list of preventive measures has been collected from participating countries within WP1 (Annex B), along with some basic details which enable a preliminary evaluation of the measures (e.g. scale of use, likely costs, results of any evaluations). The RESTRAIL project members already have some indication of a large number of preventive measures for suicide and trespass, from earlier work carried out by ProRail, Infrabel, DB, VTT, HMGU and Karlstad University.

It is apparent at this stage that there is considerable overlap in the measures in operation (or being considered) across the range of participating countries, in terms of similarities in the mode of operation of the preventative measures. Collection of detailed descriptive and quantitative details on each and every measure that has been identified in participating countries would probably produce large quantities of overlapping data. In order to avoid this, a preliminary classification and screening exercise has been carried out to rationalise the list of measures and identify the groups or families of measures that are known currently. This provides a focus and clear structure and protocol for the collection of the detailed information, which will be used in subsequent parts of the evaluation of preventative measures. This classification and screening exercise started in a group setting, using work package and task leaders from WP2 and 3 (May, 2012).

4.2.2 Treatment of similar measures ("families of measures")

RESTRAIL aims to consider the evaluation and development of different types of preventative measures, for example physical, technological and behavioural / soft measures. Each of the preventative measures that have been identified to date can be classified, though in practice, a preventative measure might be a combination of two or more of these (e.g. technological and behavioural). Alternative systems of classification are available (e.g. Rådbo et al., 2012), linked to mode of operation of the measure). All known preventative measures have been discussed by the work package and tasks leaders from WP2 and 3 and classified according to a number of classification frameworks (details are included in section 4.3). Application of this type of classification approach helps to provide focus for which measures to pursue in subsequent phases of the evaluation in the project, to ensure a balanced representation of different types of preventative measures.

4.2.3 Basic data needed for each measure (provided on evaluation forms)

More detailed information is needed to carry out an effective evaluation of the selected list of preventative measures, using the agreed set of evaluation criteria (Section 5). This additional information will be collected by project staff, across a range of participating countries, ideally in face to face meetings with people who can talk about the characteristics of the measures. Checklists / pro-formas have been prepared to support the collection of information in these face to face meetings. The additional, detailed information will be collected in those countries where it is known that a measure is operational. Other partners in the work packages (WP2 and WP3) will be asked to support this data collection exercise, for preventative measures that are applied in their countries. Work package and task leaders will provide detailed examples of the type of information that will be needed to support a detailed evaluation of the preventative measures.

4.3 Phases of evaluation process

4.3.1 Preliminary evaluation

Preliminary evaluation of measures was carried out by work package and task leaders of work packages 2 and 3 at a meeting in Stockholm 2-3 May 2012.

Review of information from Annex B (data collection in WP1) produced an overall list of the preventative measures that are used (or considered for use) in different participating countries, along with details from the preliminary evaluations of the measures which have been carried out within participating countries (e.g. based on scale of implementation, costs, results of evaluations). Basic statistics and descriptive details of these measures give an indication of the range of methods used across Europe, giving a first indication of the potential for wider application of the measure.

4.3.2 First classification and screening of measures

The work concerning the first classification and screening of measures started at the Stockholm meeting (2-3 May 2012) and continued in a teleconference (23 May). The preliminary classification and screening exercise aims to identify the groups or families of measures that are known currently for both suicide and trespass, with a view to using these as a basis to provide a focus, clear structure and protocol for the collection of the detailed information on selected preventative measures. These selected measures will be examined and evaluated in subsequent parts of the evaluation process. This classification and screening exercise therefore aims to produce a balanced representation of different types of preventative measures. This includes measures with different modes of operation (such as by design of the railway environment or behavioural approaches), with coverage of suicide and / or trespass incidents, with consideration of different methods of access to the track or other railway locations, and in relation to different target groups. A summary of the factors and different frameworks that have been considered in this classification and screening is included in Annex 1. The classification and screening process therefore will contribute to a plan that will be developed to collect information on a selection of different types of preventative measures, from a relevant set of countries.

The preliminary classification and screening has been carried out by a group of project members from WP2 and WP3 (WP leaders and task leaders), using data collected and analysed from WP1 (Annex B from the WP1 working paper), as well as other known classifications and reviews of preventative measures (e.g. review of the draft classification of known preventive measures from ProRail, Infrabel and DB).

4.3.3 Acquisition of additional data

Additional information will be collected by WP2 and 3 partners, according to the protocol that has been developed in Section 4.3.2 and using checklists, which are based around the agreed evaluation criteria (Section 5, also Annex 2).

It is important to note that there may be some overlaps between information that is collected in relation to one or more of the evaluation criteria. The important consideration at this stage of the evaluation process is that detailed, descriptive information is collected by the suite of evaluation criteria. The correct classification and interpretation of the information that has been collected will be managed at the group evaluation stage of the process (section 4.3.4). Clarification and agreement will be needed at a later stage on any weighting for application of these evaluation criteria in a subsequent part of the evaluation process.

As preliminary part of this important stage of data collection, work package and task leaders from WP2 and 3 are carrying out a number of group sessions and other supplementary analysis to

produce detailed examples of the type of information that is needed for the effective evaluation of the measures. This work will also include pre-completion of some parts of the evaluation forms (e.g. information that is essential to consider for a particular measure, or information that might be common across a number of countries – some examples of this type of information are included in Annex 3). This has been done to reduce the effort that is needed by partners and stakeholders, and to reduce duplication of effort, where this is not needed. It is expected that those collecting data in participating countries will check that any information that has been pre-completed on the evaluation form is in fact relevant in their own countries and then provide the additional information that is needed for each of the criteria on the evaluation form.

The additional information that is collected by partners in participating countries (i.e. completion of evaluation checklist forms) will be uploaded to the project website. It will be necessary to review the information periodically and request additional details where necessary, including consultation with experts if questions arise or expert opinion is needed.

Where necessary, data which have been collected on preventative measures will be sent for review by selected experts who will be able to comment on the content of the additional information (e.g. on the likely accuracy of any estimates that are made, the assumptions that are made in making estimates, or the plausibility of any expert judgements).

The information that is collected using the evaluation criteria will be examined by the work package and task leaders from WP2 and WP3 (taking account of any additional expert opinions that are relevant). A brief statement will be produced of the strengths, weaknesses, opportunities and threats (SWOT) for each of the preventative measures, along with an outline of any circumstances that are necessary for the successful implementation of the measure.

4.3.4 First group evaluation

The first group evaluation will take place in September 2012.

An expert group session (WP2 and WP3 leaders + relevant task leaders + other invited experts) will be used to determine the likely effectiveness of the preventative measures, using detailed, pre-assembled information which has been collected on the range of evaluation criteria (within 4.3.4). The expert group session will aim to identify a first set of recommended measures, which will be evaluated in detail in subsequent parts of the evaluation (e.g. CBA, Section 4.3.5.). The identification of the recommended measures will be achieved by development and analysis of a performance matrix and review of other summary analyses (e.g. SWOT, summary of circumstances for implementation – see Section 4.3.3 above). The performance matrix will list each of the preventative measures and a summary of the likely effectiveness of the measure through consensus of judgements on each of a number of evaluation criteria. More details on the use of the evaluation criteria are given in Section 5 and an example of the performance matrix is shown in Annex 4.

This first group evaluation will also include evaluation of the “soft” measures” which will be developed as part of the RESTRAIL project (as outlined in the DoW). Some more in-depth review and evaluation of soft measures for prevention of suicide and trespass will be carried out in parallel with the broader evaluation that is described in this deliverable (Tasks 2.3, 3.3). This work will also include the development of new soft measures for prevention of trespass (task 3.3). Partners from tasks 2.3 and 3.3 will contribute where necessary to the general evaluation of the broad range of preventative measures that has been described in this deliverable, and will take relevant findings from this evaluation to inform other activities as part of the work in tasks 2.3 and 3.3.

4.3.5 Detailed cost benefit analysis

Cost benefit analysis (CBA) is an important part of the cycle of understanding and quantifying risk, monetising its effects and the cost of reducing it. CBA is a systematic approach to estimate the

costs and benefits of different safety measures. Cost-benefit analysis is a prescriptive technique that is performed for the purpose of informing policy makers about what they ought to do. It is based on welfare economics and requires all policy impacts to be stated in monetary terms.

The aim of the analysis is to evaluate the cost-benefit ratio under consideration of the related costs (purchase, operation, maintenance) and the benefit in the form of expected reductions in the costs of railway suicides and trespassing accidents as a monetary value. For the evaluation of the benefit, statistical values can be applied. As an example, the ERA (European Railway Agency) documentation and the EU funded project HEATCO (2006) propose monetary values for the prevention of traffic injury.

The aim of the analysis is the evaluation of the expected reductions in the costs of railway suicides and trespassing accidents which can be reached, for example by implementation of new technology.

Detailed cost-benefit analyses will be carried out for each of the recommended measures. This will include identification of the range of costs and benefits for use in proposed analysis (building on preliminary information that has been collected in 4.3.3). Outputs will include details of relevant national figures and values, with the opportunity to develop these into a tool for use in future analyses (e.g. enabling sensitivity analysis for different cost / benefit inputs for implementation of measures in different countries). Methodology for the cost benefit analysis will be developed as part of work in tasks 2.2 and 3.2, but is likely to build on a common simplified method that is used in European projects SELCAT and Rosa (Woods et al., 2008).

When C = cost of the measure and B = benefits of the measure, the cost-benefit ratio for each measure can be roughly categorised as follows:

C/B	Rating
< 0.5	Favourable
0.5...2	Well-balanced
> 2	Unfavourable

4.3.6 Second group evaluation

A second expert group session (WP2 and WP3 leaders + relevant task leaders + industry experts) will be used to focus on the practicalities of implementation of the preventative measures. This expert group will use outputs from the initial expert group session to identify recommended measures, and the detailed Cost-benefit analyses for these recommended measures. The impacts of preventative measures are often in combination and rarely in isolation. This part of the evaluation may therefore include also first evaluations of the likely effectiveness of the preventative measures in combination. This expert group session, incorporating industry experts, will aim to deliver a set of recommended measures for testing (potentially in combination) in WP5. This could include guidance on the likely considerations for success of the implementation of the measures (e.g. the likely locations, characteristics of cultures, situations in which implementation of the measures are likely to be successful).

4.4 Documentation of results

The documentation of the evaluation results will be written under the responsibility of the Task 2.2, 2.3 and task 3.2 leaders. It will be integrated as the first part of the final deliverables of WP2 and

WP3, and will consist of two general documents, common to WP2 and WP3, which will be used to carry out the evaluation of the measures in order to identify the best measures for the prevention of suicide and trespass, namely:

- The Evaluation Plan and Specifications, which will be produced before the evaluation and describe how the evaluation is to be carried out. This report will use the contents of section 4 and 5 of the present deliverable.
- The Evaluation Reports, which will provide the conclusion of the evaluation carried out based on the Evaluation Plan and Specifications.

4.4.1 General

The evaluation report will classify each evaluated measure as Recommended / Promising / Questionable, and will provide detailed reasons for this classification. The evaluation report will provide an overview of the evaluation and will include any necessary background material. Any relationship between this evaluation and any other will be described, as appropriate. The objectives of the evaluation will be expressed as a series of bullet points; this section will also detail precisely the measures that will be evaluated.

The evaluation report will include the following sections:

1. **Executive Summary**: This should consist of no more than one A4 page and will summarise the **evaluation** undertaken, together with the results and conclusions.

2. **Introduction**: This section will provide an overview of the evaluation and include any necessary background material. Any relationship between this evaluation and any other will be described, as appropriate.

3. **Aims, Objectives and Scope of the Evaluation:** This section will detail the aims of the evaluation. The objectives of the evaluation will be expressed as a series of bullet points. This section will also detail precisely the measures that will be evaluated. It will itemise specific versions and will detail all relevant documentation.

4. **Assumptions and Constraints:** This part of the report will detail any assumptions made in connection with the evaluation, together with the constraints under which the evaluation was conducted.

5. **Measure Evaluation:** This part of the report will detail the activities undertaken in process evaluation. It will summarise the results and evidence obtained from the evaluation, and will provide the evaluator's opinion regarding the implementation and user feedback of the measure.

6. **Evaluation and Summary of Results:** This section of the Evaluation Report will provide a summary of the evaluation findings as detailed in section 5 of the report and will provide an evaluation.

7. **Evaluation Recommendation:** This section will provide a recommendation from the evaluator as to whether the measure is Recommended / Promising / Questionable.

8. **Appendix A: Evaluation Results.** This appendix should provide details of the principles and criteria used in the evaluation, together with the results. See section 5 below for the contents of appendix A.

4.4.2 Documentation of results for individual measures

The evaluation of each measure will be provided in section 5 and 6 of the evaluation report, as a series of subsections (evaluation forms), devoted each to one measure. Each evaluation form will have the same, self-sufficient structure so that the evaluation of each measure can be used independently from the others. As described above, section 5 will provide the details of the considerations and data leading to the evaluation results, whereas section 6 will provide a summary of these findings and the evaluation for each measure, following the template given in Annex 2.

4.4.3 Summary documentation

A table summarising the results for each measure and for each criterion listed in section 5.1 below, will be available in the end of section 6 of the Evaluation Report. It will provide a synoptic view of the findings that have led to the classification of each measure as Recommended / Promising / Questionable, and it will be usable as a quick overview of the evaluation, while the detailed evaluation of each measure will be available in section 5 and 6. This table will have the following structure:

Measure number	Measure name	Countries where applied (or planned)	Scores (0, 1 or 2)					Total score	Recommendation (Recommended, Promising or Questionable)	Comments from the evaluation group
			Criterion 1	Criterion 2	Criterion 3	…	Criterion 12			
1	Mass media campaigns	FI, UK, …	2	2	1	…	1	15	Promising	
2	Fences and barriers at stations	FR, UK, …	2	1	2	…	1	21	Recommended	
3	…									
4										
5										

5. EVALUATION CRITERIA

5.1 Overview of evaluation criteria

In the following a brief overview of evaluation criteria is provided. More detailed explanations and instructions for the application of the criteria are described in section 5.2.

5.1.1 Description of evaluation criteria

Based on the requirements described earlier the following criteria are used in the evaluation of measures for the prevention of railway trespassing and suicide. These criteria are based on those used in previous EU research (e.g. Elvik), but have been adapted for use in this rail related context. The criteria include principles within RAMSHEC[2] which are core components of rail infrastructure business

1. Description of the measure
2. Definition of target incidents
3. Size of the problem
4. Effect on incidents
5. Durability of effects
6. Costs and benefits
7. Integration with other policy measures
8. Impact on railway operations
9. Impact on people and jobs
10. Technological issues
11. Environmental issues
12. Acceptance
13. Transferability issues
14. Additional information

These criteria are briefly explained below.

Description of the measure provides a description of relevant features of the measure.

Definition of target incidents answers the question what kinds of incidents the measure is intended to reduce. It refers to specific type of incidents, but can focus on a specific group of people, e.g. school children.

Size of the problem provides a quantitative estimate of the frequency of target incidents (e.g. trespassing accidents in the target group per year).

Effect on incidents means the expected effect (in per cent) on target incidents (as defined above). The effect in absolute number of incidents can then be calculated by multiplying this estimate by “size of the problem”.

[2] RAMSHEC - **Reliability, Availability, Maintenance, Safety, Health, Environment, Cost** (Jovanovic & Zoeteman 2010). Some of these RAMSHEC principles are obvious within the main evaluation criteria, whilst the remaining are subsumed within other evaluation criteria.

Durability of effects concern the durability of the effects on target incidents: are they likely to remain fairly stable or is there reason to believe that they will erode with time.

Costs and benefits should provide approximate estimates of the costs and benefits, if available. A more detailed cost benefit analysis will be conducted for a limited number of most promising measures that will be identified in the first group evaluation.

Integration with other policy measures describes how the measure is integrated with other preventative measures or interventions.

Impact on railway operations means the positive or negative effect on the running of trains.

Impact on people and jobs means especially the effects on the health and jobs of people within railway industry (e.g. the number of staff in different job categories and changes in the roles of people) but also elsewhere if relevant.

Technological issues concern changes in the existing technology and infrastructure caused by the implementation of the measure, including the readiness of technology for new interventions.

Environmental issues concern impacts on the environment in general, e.g. different kinds of pollution, impacts on scenery and wildlife).

Acceptance provides an estimate of how well the measure is accepted by the public and relevant stakeholders (e.g. policy makers, industry).

Transferability issues concern the functionality of the measure in different environments and in different scales, e.g. is it likely that the effects are different in different countries or depend of the scale of the implementation.

Additional information can be any relevant information that is not dealt within the issues listed above, e.g. notes on the strengths, weaknesses, opportunities and threats concerning the conducted evaluations.

5.1.2 Type of information that is needed for each preventative measure, based around the evaluation criteria

In the first part of the evaluation process, brief descriptive details of the measure are provided. Countries in which the measure is used can be recorded. A series of additional checklists are then completed to aid classification of the measure, including the circumstances in which the measure could be appropriate and the mode of application of the measure. Additional details are collected on how the measure in question fulfils each of the criteria listed in section 5.1.1 above. Where this is completed by the project partner in a meeting (or telephone) discussion with an industry contact or expert, it will be important to ensure that sufficient details are collected on the preventative measure, in relation to each of the criteria, so that later stages of the evaluation (i.e. the expert evaluation session) can be carried out on the basis of good background information. Project partners should first check that any pre-completed information on the form is accurate for application of the measure in their country. They should then add additional relevant details. If the project partner asks an industry contact to supply written responses as part of the evaluation of the preventative measure (e.g. using the criteria as the basis of a form of survey), it will be necessary for the project partner to check that sufficient information has been provided by the industry expert. If necessary, the industry expert should be contacted again to ask for additional information.

5.1.3 Scoring and weighting of the information on each of the criteria

In order to enable easy sorting and categorisation of measures according to different criteria – a score is given for each criterion describing how well the measure in question fulfils it. A three-step score with values 2, 1 or 0 (from best to worse) is used, based on the verbal descriptions and other

details obtained in relation to each of the criteria. For example, the *definition of target group* can be given a score 2 (adequate), 1 (fair) or 0 (superficial). The verbal descriptions of the scores for each criterion are given in section 5.2. Scores will be first given in the first group evaluation (see Figure 1, page 14), but they can be changed in the later stages of the evaluation process as the descriptions become more accurate.

Minimum scores for some key criteria may be used to discard bad measures early in the evaluation process if, for example, it seems clear that the measure does not have any significant effect on the frequency of incidents.

A "traffic light" system of colour coding will be used to record the scores / ratings of the most promising, moderate, problematic aspects of the evaluation. This will enable easier examination of the performance matrix to compare the effectiveness of the different measures across the range of criteria. An example of the performance matrix is given in Annex 4.

Some criteria may be more important than others. Therefore they may be given different weights in the evaluation. This weighting is usually carried out at the group evaluation stage in this type of evaluation process and will therefore be decided during the discussions at (or leading up to) the group evaluation in September 2012. The same weights must apply for all measures.

5.2 Guidelines for evaluation of different measures

5.2.1 General guidelines

The evaluation of selected preventative measures, using information that has been collected on each of the evaluation criteria in participating countries, is carried out by an expert group (Section 4.3.4). The form to support the collection of information, based around the evaluation criteria, is given in Annex 2, and examples of filled forms are provided in Annex 3. Instructions for completion of the forms are given in section 5.2.2 below.

5.2.2 Specific guidelines for collection of relevant information in relation to each of the different criteria

The evaluation form (Annex 2) contains a series of checklist questions relating to each of the criteria, to help those involved in collecting the information on preventative measures to provide the best possible information for the purpose of evaluation. Those collecting the information in participating countries should check that the information that has been provided has taken account of these questions, as far as possible. These are not the only questions that could be considered in relation to each of the criteria, but provide a good basis on which to start collecting information for a thorough evaluation.

In the following the expected input into different parts of the evaluation is explained.

Document history

The first box in the form provides information of consecutive updates of the form: who provided the first draft and when, and who updated it later and when. The author can be a person or it can refer to group evaluation (e.g. First group evaluation). Lines can be added if there are more than three updates of the form.

Countries where implemented

Enter acronyms of countries where the measure in question has been implemented or where it is being planned.

Title and number of measure

Enter name of measure. The name should be detailed enough to describe the essential features of the measure. The measures will be numbered 1, 2, 3… The numbering will be decided in the first group evaluation.

Type of measure

The measures are classified according to three different modes of operation as follows.

Type 1 describes whether the measure is *social, physical, technical* or *behavioural*.

Type 2 divides measures into categories *primary, secondary* and *tertiary* (Wassermann & Durkee, 2009). This categorisation is especially relevant for measures targeting railway suicides. Primary prevention is based on population level and targets the railway system as a whole. Primary prevention aims at reducing risk factors, strengthening protective factors and increasing awareness of suicidal behaviour. Secondary prevention is based on individual level, specifically targeting at risk individuals and individuals with mental health problem. This type of prevention focuses on eliminating suicidal risks factors by intervening. The aim of secondary intervention is the identification of subjects at risk and to provide knowledge of ways of dealing with subjects in a desperate situation. Tertiary prevention focuses on suicide survivors and their families. The aim of tertiary prevention is to reduce incidence of relapses and to prevent deterioration.

Type 3 discriminates between measures that are meant to *reduce attractiveness* of railways for trespassers and as a means for suicide, *obstruct access* to railways, *influence determination* of those who intend to trespass or commit suicide, *provide early warning* of such intentions and measures that are meant to reduce the impact of collision (Rådbo et al. 2012).

Description of the measure

The title of the measure should give a good overall idea of the measure. The description following the title should include all relevant features of the measure so that all those who read the description have similar and correct impression of the measure. What is relevant may depend on the nature of the measure. Questions to be considered include:

- What is done and by who?
- What categories of infrastructure, equipment or people are targeted?
- What is the (geographic) scale of implementation (for physical measures)?
- What is the duration of the measure (e.g. for campaigns)?
- Does the measure include repetition or maintenance?
- Is the measure implemented independently or in connection with other measures?
- Are there some key features that make this measure different from other similar measures?

The rating of Description of the measure: 2 = Adequate, 1 = Fair or 0 = Superficial.

Definition of target incidents

Definition of target incidents should provide a verbal description of what kinds of incidents (suicides and/or trespassing accidents) the measure is meant to decrease. The issues to be considered include, for example:

- suicides or trespassing accidents or both
- location (e.g. at particular stations)
- target population (e.g. children, people with mental condition)
- type of target behaviour (e.g. playing on tracks, criminal behaviour)

In addition to the verbal description, the target incidents should be described by ticking all relevant categories in the following:

☐ Suicide	☐ Children 0–12	☐ Track
☐ Trespass	☐ Youngster 13–17	☐ Level crossing
	☐ Adult 18–59	☐ Station
☐ Wandering	☐ Senior 60+	☐ Bridge
☐ Lying / sitting		
☐ Jumping	☐ Concerns mental illness	☐ Daytime
		☐ Nighttime
☐ Crossing thre track	☐ City	☐ Dawn
☐ Walking along the track	☐ Countryside	☐ Dusk
☐ Crime		
☐ Playing		
☐ Intentional risk behaviour		

The definition of target incidents should be compatible with the description of the measure.

The rating of Definition of target incidents: 2 = Adequate, 1 = Fair or 0 = Superficial.

Size of the problem

The size of the problem should provide a quantitative estimate of the frequency of target incidents (e.g. certain type of trespassing accidents at certain locations per year), and also describe briefly how the estimate was derived (including assumptions that were made in the derivation).

The size of the problem multiplied by the effect of the measure on incidents (in percent) provides an estimate of the number of incidents (e.g. per year) that can be prevented by the measure.

It is recognised that accurate estimates are seldom if ever possible, at least not within the time frame and budget of the RESTRAIL project. Even a rough estimate of the order of magnitude (Does the measure affect e.g. 0.1, 1, 10 or 100 incidents per year?) can be useful in the estimation of the overall usefulness of the measure, and helps to avoid gross over- and underestimation of safety effects.

National statistics of railway suicides and trespassing accidents can often be used to determine upper limits of the size of the problem. For example, if the total annual number of trespassing accidents is 100, and it is known that 70% of them occur on railway lines outside stations, it may not be likely that a measure targeting trespassing accidents at stations and implemented at 5% of all stations targets more than 5 or 10 trespassing accidents per year, even if the measure is implemented at the stations where trespassing is most frequent.

Regarding statistics of suicides and trespassing accidents, it should be noted that because of random variation (that is inherent in all accident counts) especially small (annual) numbers vary considerably around the true mean (long term average) even though the actual level of safety remains unchanged. For example, if the long term average is 9 suicides per year, the approximate 95% confidence interval of annual counts is from 3 to 15 ($9 \pm 2 \times \sqrt{9}$) even if the level of safety remains the same. To alleviate over- or underestimation caused by random variation it is recommended to use average annual numbers from three or five years rather than only one, most recent year, assuming that there have been no major changes in the circumstances that target incidents.

The size of the problem can also be narrowed down by the help of the categories in *Definition of target incidents* above, especially if the categories independent. For example, if the measure targets suicides of youngsters at level crossings and we know that the total annual number of

suicides is 100 and 30% of them concern youngsters and 17% of them occur at level crossings, it may be reasonable to assume that the size of the problem is not more than 5 per year (~0,30×0,17×100).

If there is information about the link between behaviour and incidents, the size of the problem can perhaps be estimated indirectly using behavioural observations. For example, if a measure is targeted to reduce illegal crossing of the railway at a location, where on the average 130 people cross the railway daily, and we know that at similar locations one trespassing accident results on the average from 25,000 crossings, we can conclude that the size of the problem is approximately 2 trespassing accidents per year (~365×130/25,000).

Overall, the best way to estimate the size of the problem depends on the measure and the kind of data that is available. Even if accurate estimates cannot be derived, the examples above show that there are ways to narrow down the size of the problem. In any case, even a rough estimate is better than no estimate at all, when also the assumptions made in deriving the estimate are made clear.

The rating of Size of the problem: 2 = Major (>20 incidents/year), 1 = Medium (2-20 incidents/year) or 0 = Minor (< 2 incidents/year).

Effect on incidents

The effect on incidents means the expected effect on target incidents (as defined above) *in per cent*. The effect on incidents multiplied by size of the problem (as defined above) provides an estimate of the expected reduction in the number of incidents (e.g. incidents per year) that can be achieved by the measure.

In the best case the effect on incidents can be roughly estimated on the basis of previous evaluation studies of the effects of similar measures. It is to be expected, however, that in most cases such studies are not available, and the effect on incidents must be estimated by other methods.

It may well be that in practice the estimated effect on incidents will be determined in the group evaluation meetings, after discussion of the participating experts. Before the decision it is probably useful to discuss the effect mechanism of the measure, and consider issues like

- is it likely that the target population is willing to comply with the measure,
- how easy is it to avoid the potential inconvenience that is caused by complying with the measure,
- is it likely that the effect will not erode with time,
- are there penalties for not complying with the measure,
- how is the compliance with the measure enforced.

In any case, the rationale for the estimate should be explained, e.g. by providing references to previous studies or explaining the reasoning discussed at the group evaluation.

As was the case of determination of the size of the problem, it is likely that in most cases the effect on incidents can be defined only roughly. But even rough estimates of the size of the problem and the effect on incidents provide a useful estimate of the effect of the measure on the (annual) number of incidents. Systematic evaluation and documentation of the reasoning behind the estimates makes it also easy to update the estimates later if better information becomes available.

The rating of Effect on incidents: 2 = > 20% reduction, 1 = 5–20% reduction or 0 = negligible or cannot be estimated.

Durability of effects

Durability of effects should describe whether the effect on incidents is likely to remain fairly constant, with little change with time (either decrease or increase). Issues to be considered include:

- What issues could affect the durability or on-going success of the measure?
- What steps are needed to sustain the effectiveness of the measure (e.g. commitment from policy makers or industry)?

The rating of Durability of effects: 2 = Likely to remain stable (or even improve), 1 = Slight decline expected, 0 = Fast decline expected.

Costs and benefits

A full cost benefit analysis will be carried out only for most promising measures that are identified in the first group evaluation (Figure 1), and the analysis is described in section 4.3.5. In the earlier stages of the evaluation process the estimation of costs and benefits is not necessary. If results of cost benefit analysis of the same or similar measures are available, their results can be indicated on the evaluation form, also providing a reference to the original document. You should also list details of the main costs and benefits that could influence the ratio.

The rating of Costs (C) and benefits (B): 2 = Favourable (C/B < 0.5), 1 = Well balanced (C/B = 0.5…2), 0 = Unfavourable (C/B > 2).

Integration with other policy measures

Integration with other policy measures should provide essential information concerning the implementation of the measure and its interaction, interface and integration with other policy measures. The following issues that should be considered:

- Are there constraints, obstructions or preconditions for successful implementation?
- What kind of organisational issues should be considered prior to implementation (e.g. concerning communication and coordination)?
- Does the effectiveness of the measure depend on other measures? If yes, what should be done to ensure the desired effect?
- Are there issues concerning the maintenance of the measure that should be solved before implementation?
- Does the measure have positive or negative effects on the performance of other measures?

The rating of Integration with other policy measures: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems.

Impact on railway operations

Impact on railway operations should include descriptions of the impacts of the measure on the running of trains or other railway operations. The issues to be considered include:

- positive and negative impacts (including quantification of the impacts, as well as descriptions of these impacts, if possible)
- the effects on the availability of track
- effects on the reliability of the train service, train schedules and the speed of trains
- possibilities to mitigate undesired effects

The rating of Impact on railway operations: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems.

Impact on people and jobs

Impact on people and jobs should describe essential impacts of the measure on people within and outside railway industry. The following issues should be considered:

- number of new staff needed, or loss of jobs
- work schedules, hours of work
- training and education
- health
- safety and security
- privacy
- people living near railway tracks
- organisational issues

Some impacts on people can also be described under Environmental issues (e.g. increased noise for people living close to the railway), and there is no need to report them twice.

The rating of Impact on people and jobs: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems.

Technological issues

Technological issues should include descriptions of relevant aspects concerning the technological implementation and maintenance of the measure. Issues to be considered include:

- is the necessary technology available,
- is the functioning of the technology tested and suitable for the conditions,
- is the technology reliable enough for the application in question,
- are there specific issues concerning maintenance that must be taken into account
- the impacts of new technology on the operation of the existing railway system
- electro-magnetic compatibility
- is the new technology compatible with existing infrastructure and other existing technology
- expected development of relevant technology in foreseeable future

The rating of Technological issues: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems.

Environmental issues

Environmental issues should describe the effects on the environment following from the implementation of the measure. Issues to be considered include:

- all kinds of harmful emissions (including e.g. gases, particles and noise)
- impacts on vegetation and wildlife
- impacts on scenery and landscape
- short and long term effects
- changes in energy consumption

The rating of Environmental issues: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems.

Acceptance

Acceptance refers to opinions of relevant groups of people towards the measure: how acceptable it is to them. Issues to be considered include:

- who are the people whose opinions count most,
- consider groups like general public, decision makers, different organisations in the railway industry, railway passengers, other interest groups and staff in particular jobs,
- what features of the measure are most likely to raise resistance,
- what could be done to make the measure more acceptable

The rating of Acceptance: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems.

Transferability issues

Transferability issues should provide a description of aspects that should be taken into account when planning the implementation of the measure that has been successful in one kind of situation to a different environment or in a different scale. Issues to be considered include:

- differences in infrastructure and train traffic
- differences in the level of safety (frequency of railway suicides and trespassing accidents)
- differences in the cost of the measure
- cultural differences
- legal framework
- changes in the scale of implementation
- changes in the design of the measure
- organisational issues
- what can be done to mitigate problems concerning transferability.

The rating of Transferability issues: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems.

Additional information

Additional information should provide a description of relevant aspects that have not been described earlier on the form, e.g.;

- particular strengths and weaknesses of the measure
- opportunities for further development
- potential threats for effective functioning of the measure in the long run
- evaluation of the evaluation process as a whole and the reliability of the results.

5.2.3 Guidelines for making recommendations for the preventative measures

Finally, based on the result of the evaluation, each measure will be assigned into one of three categories: *recommended*, *promising* or *questionable*. The assignment will be decided by the group evaluation team, but as a starting point the following rules could apply:

Measures in the category *Recommended* should, for example

- have a large group of target incidents or have a large impact on target incidents or both
- produce benefits that are larger than costs
- should not have significant negative impacts on railway operations or people and jobs in the railway industry
- not have major obstacles to integration into existing infrastructure and other policy measures.

Measures in the category *Promising* could, for example

- have technical implementation or maintenance problems that could be solved in near future
- have less than desirable effects on target incidents, but the effect could be significantly increased by improved design and implementation
- be too expensive at present, but there are new methods or tools in sight that could significantly reduce the cost.

Measures in the category *Questionable* could, for example

- have very small target group or very small impact on incidents, or both
- be very expensive compared to the benefits
- have significant negative impacts e.g. on railway operations, people and jobs or the environment
- have major obstacles to integration into existing infrastructure and other policy measures
- have been designed to fit specific environments and situations that are not likely to exist elsewhere or are likely to disappear in near future.

The sum of scores given for different criteria (2, 1 or 0) can be used as guidance for assigning measures into categories *recommended*, *promising* or *questionable*, but strict rules for the link between the sum of scores and this categorisation may not be necessary.

Example of the types of detail that could be collected for preventative measures are presented in Annex 3. The forms will be first filled in the first screening of measures (for the measures that pass the screening) and revised and completed at later phases of the evaluation process (Figure 1). However, project partners providing initial descriptions of measures may also write them on the forms.

6. REFERENCES

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ANNEXES

Annex 1: Classification of preventative measures according to their mode of operation and target group

Annex 2: Evaluation form

Annex 3: An example of a filled evaluation form

Annex 4: An example of a performance matrix

Annex 1: Classification of preventative measures according to their mode of operation and target group

Mode of operation

Main *characteristics* of the preventative measures	☐ Social ☐ Physical ☐ Technical ☐ Behavioural
Type of prevention measure (Wassermann & Durkee, 2009)	☐ Primary ☐ Secondary ☐ Tertiary
The *mode of operation* of the preventative measure (Rådbo et al, 2012)	☐ reducing attractiveness ☐ obstruct access ☐ influence determination ☐ early warning ☐ reduce impact of collision

Target group

Whether the measure is appropriate for *suicide or trespass*	☐ Suicide ☐ Trespass
Whether the measures protects against the following *types of activities linked to suicide*	☐ Wandering ☐ Lying / sitting ☐ Jumping
Whether the measures protects against the following *types of activities linked to trespass*	☐ Crossing the track ☐ Walking along the track ☐ Crime ☐ Playing ☐ Intentional risk behaviour ☐ Other
Type of *at risk groups* that are targeted by the measure (if applicable)	☐ Children 0-12 ☐ Youngster 13-17 ☐ Adult 18-59 ☐ Senior 60+
Whether the measure has a value in cases of *mental illness*	☐ Yes ☐ No
Whether the measure is targeted at different *types of geographical location*	☐ City ☐ Countryside
Whether the measure is targeted at *specific locations on the railway infrastructure*	☐ Track ☐ Level crossing ☐ Station ☐ Bridge
Whether the measure operates effectively at different *times of the day*	☐ Daytime ☐ Nighttime ☐ Dawn ☐ Dusk

Annex 2: Evaluation form

Evaluation form

for the evaluation of measures targeted to reduce railway suicides and trespassing accidents

The kind of information that is requested on each croiterion is briefly described on the form below. More detailed explanations are provided in chapter 5.2.

Created by: _____ Date: _____

Modified by: _____ Date: _____

Modified by: _____ Date: _____

Modified by: _____ Date: _____

Countries where implemented

(use country codes AT, BE, BG, CY, CZ, DE, DK, EE, ES, FI, FR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SI, SK, UK)

Title and number of measure

number:

Type of measure

Mark 'X' in only one box in each of the following three categories according to mode of operation (see section 5.2.2 for explanations)

Type 1	Type 2	Type 3
☐ Social	☐ Primary	☐ Reducing attractiveness
☐ Physical	☐ Secondary	☐ Obstruct access
☐ Technical	☐ Tertiary	☐ Influence detemination
☐ Behavioural		☐ Early warning
		☐ Reduce impact of collision

1 **Description of measure**

Describe relevant features of the measure: What is done? In what kind of environment? What is the scale of implementatio

Score: 2 = Adequate, 1 = Fair, 0 = Superficial (description of measure) score:

2 **Definition of target incidents**

Provide brief verbal description of target incidents and tick all relevant categories in the lists below.

Mark 'X' in all relevant boxes

☐ Suicide	☐ Children 0–12	☐ Track
☐ Trespass	☐ Youngster 13–17	☐ Level crossing
	☐ Adult 18–59	☐ Station
☐ Wandering	☐ Senior 60+	☐ Bridge
☐ Lying / sitting		
☐ Jumping	☐ Concerns mental illness	☐ Daytime
		☐ Nighttime
☐ Crossing thre track	☐ City	☐ Dawn
☐ Walking along the track	☐ Countryside	☐ Dusk
☐ Crime		
☐ Playing		
☐ Intentional risk behaviour		

Score: 2 = Adequate, 1 = Fair, 0 = Superficial (definition of target incidents) score:

3 **Size of the problem**

Provide an estimate of the annual number incidents in the target group. Explain how the estimate was derived. Separate estimates can be given for suicides and trespassing accidents when relevant.

Score: 2 = Major (> 20 incidents per year), 1 = Medium (2-20 incidents per year), 0 = Minor (< 2 incidents per year) score:

4 **Effect on incidents**

Provide an estimate of the percentage reduction in the number of target incidents that can be achieved by implementation of the measure. Explain how the estimate was derived. Separate estimates can be given for suicides and trespassing accidents when relevant.

Score: 2 = > 20% reduction, 1 = 5-20% reduction, < 5% = or cannot be estimated score:

5	**Durability of effects** Describe if the effect on incidents is likely to remain sdable (or even increase) or decrease with time, and why. What could or should be done to maintain the effect on high level? Score: 2 = Likely to remain stable (or even improve), 1 = Slight decline expected, 0 = Fast decline expected	score:
6	**Costs and benefits** If possible, provide estimate of the ratio costs/benefits (C/B) and explain how this estimate was derived (e.g. refer to documented study, list the main types of costs that influence this ratio). Consider implemetation, maintenance and organisational costs. Score: 2 = Favourable (C/B < 0.5), 1 =Balanced (C/B = 0.5...2), 0 = Unfavourable (C/B > 2)	score:
7	**Integration with other policy measures** Consider following issues: How the emasure interacts, interfaces or integrates with other preventative measures? Constraints or obstructions for implementation? Preconditions for implementation? How the measure can impact other measures? Does the effectiveness of the measure depend on implementation of other measures - if yes, which? Are there organisational or communication issues that need to be solved? Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score:
8	**Impact on railway operations** How does the measure impact on the running of trains (reliability of train service, availability of track)? Is it possible to quantify these impacts? What could or should be done to mitigate such undesired impoacts? Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score:
9	**Impact on people and jobs** Consider people in and outside railway industry. How would implementation of the measure affect people and their jobs? Consider issues like loss of jobs, training and education, safety and health, number of staff needed, impacts on organisations. Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score:
10	**Technological issues** Consider following issues regarding necessary technology: Is it available and reliable? If not, is it likely that the situation will be improved in near future? Is it compatible with current infrastructure design and relevant standards? Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score:
11	**Environment** Consider issues like emissions, energy, scenery, wildlife, impacts on people near the track, short and long term effects. Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score:
12	**Acceptance** Estimate how relevant groups of people (e.g. staff, passengers, train operators, infrastructure managers, people living near tracks) accept the measure? What are the likely reasons for non-acceptance? Explain the basis of the estimate(s). Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score:
13	**Transferability issues** What needs to be considered when applying the measure to another kind of environment (or country) or in different scale? What are the necessary preconditions for successful implementation of the measure in different environments or scale? How could the problems concerning transferability be solved? Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score:
14	**Additional information** Describe any other relevant issues concerning successful implementation of the measure that are not mentioned above.	
	Total score	0
	Overall rating: 2= Recommended, 1 = Promising, 0 = Questionable	

Annex 3: Example of a filled evaluation form

Evaluation form

for the evaluation of measures targeted to reduce railway suicides and trespassing accidents

The kind of information that is requested on each croiterion is briefly described on the form below. More detailed explanations are provided in chapter 5.2.

Created by:		Date:	
Modified by:		Date:	
Modified by:		Date:	
Modified by:		Date:	

Countries where implemented

(use country codes AT, BE, BG, CY, CZ, DE, DK, EE, ES, FI, FR, HU, IE, IT, LT, LU, LV, MT, NL, PL, PT, RO, SE, SI, SK, UK)

Title and number of measure

Removal of vegetation

number:

Type of measure

Mark 'X' in only one box in each of the following three categories according to mode of operation (see section 5.2.2 for explanations)

Type 1	Type 2	Type 3
☐ Social	☒ Primary	☐ Reducing attractiveness
☒ Physical	☐ Secondary	☐ Obstruct access
☐ Technical	☐ Tertiary	☐ Influence detemination
☐ Behavioural		☒ Early warning
		☐ Reduce impact of collision

1 **Description of measure**

Describe relevant features of the measure: What is done? In what kind of environment? What is the scale of implementatio

Design of the railway environment to increase visibility of people on the railway. This includes an initial intervention to remove vegetation in known high priority areas and supported by on ongoing programme of work to maintain the vegetation at acceptable levels. High priority areas include the areas near to crossings, stretches of high speed open line, areas near to stations As an example this might include removal of all vegetation or specific bushes or trees in the vicinty of a crossing or stationwhere there is a known problem.
The measure removes a source of concealment (whether people hide deliberately or accidentally) so can influence the behaviours of both potential suicide victims and trespassers.

Score: 2 = Adequate, 1 = Fair, 0 = Superficial (description of measure) score: 2

2 **Definition of target incidents**

Provide brief verbal description of target incidents and tick all relevant categories in the lists below.

Largely aimed at people who may be hide in vegetation at some high risk locations, prior to attempts at suicide, or trespasses from a range of groups who may not be visisble in sufficient time because of excess vegetation.

Mark 'X' in all relevant boxes

☒ Suicide	☒ Children 0–12	☒ Track
☒ Trespass	☒ Youngster 13–17	☒ Level crossing
	☒ Adult 18–59	☐ Station
☒ Wandering	☒ Senior 60+	☐ Bridge
☐ Lying / sitting		
☒ Jumpers	☐ Concerns mental illness	☒ Daytime
		☒ Nighttime
☒ Crossing thre track	☒ City	☐ Dawn
☒ Walking along the track	☒ Countryside	☐ Dusk
☒ Crime		
☒ Playing		
☒ Intentional risk behaviour		

Score: 2 = Adequate, 1 = Fair, 0 = Superficial (definition of target incidents) score: 2

3	**Size of the problem** Provide an estimate of the annual number incidents in the target group. Explain how the estimate was derived. Separate estimates can be given for suicides and trespassing accidents when relevant. Of the 220 (approximately) suicide cases per year in GB the numbers of suicide victims who could be concealed by vegetation prior to an incident are estimated as 30. The numbers of trespassers involved in incidents (aproximately fifty in total per year), who are likely to be obscured by vegetation are (or could be obscured in known high risk locations) is about 10. Then nationwide about 40 cases are affected by excess vegetation that could be removed. It is further estimated that the current measure targets about 1/4 of these. Then the size of the problem is about 10 per year. Score: 2 = Major (> 20 incidents per year), 1 = Medium (2-20 incidents per year), 0 = Minor (< 2 incidents per year)	score: 1
4	**Effect on incidents** Provide an estimate of the percentage reduction in the number of target incidents that can be achieved by implementation of the measure. Explain how the estimate was derived. Separate estimates can be given for suicides and trespassing accidents when relevant. There are no known results from previous studies concerning similar measures. The evaluation team astimates the effect to be a reduction between 5 and 20 percent. Score: 2 = > 20% reduction, 1 = 5-20% reduction, < 5% = or cannot be estimated	score: 1
5	**Durability of effects** Describe if the effect on incidents is likely to remain sdable (or even increase) or decrease with time, and why. What could or should be done to maintain the effect on high level? The effects should be durable (no place to hide, or be concealed accidentally), as long as a sufficient maintenance programme can be implemented. It is possible that potential victims could be displaced to other areas of the railway, meaning that the vegetation management programme might need to be extended to other locations. Score: 2 = Likely to remain stable (or even improve), 1 = Slight decline expected, 0 = Fast decline expected	score: 2
6	**Costs and benefits** If possible, provide estimate of the ratio costs/benefits (ΔC/ΔR) and explain how this estimate was derived (e.g. refer to documented study, list the main types of costs that influence this ratio). Consider implemetation, maintenance and organisational costs. No results are available of cost benefit ratio. The costs will include initial clearance costs (e.g. 1617 Euro/10000m^2) and a regularmaintenance cost (e.g. 420 Euro/10000m^2) Score: 2 = Favourable (ΔC/ΔR < 0.5), 1 =Balanced (ΔC/ΔR 0.5…2), 0 = Unfavourable (ΔC/ΔR > 2)	score:
7	**Integration with other policy measures** Consider following issues: How the emasure interacts, interfaces or integrates with other preventative measures? Constraints or obstructions for implementation? Preconditions for implementation? How the measure can impact other measures? Does the effectiveness of the measure depend on implementation of other measures - if yes, which? Are there organisational or communication issues that need to be solved? Removal of vegetation could reduce the effect of vegetation used as a barrier - if this were the case then alternative barriers would be needed. Removal could also conflict with other interests (i e animal protection). People living nearby may not like the removal of established trees and communication might be needed to mitigate effects of this (to municipalities and neighbours). Removal of vegetation might have positive impacts on camera surveillance (visibility). Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score: 1
8	**Impact on railway operations** How does the measure impact on the running of trains (reliability of train service, availability of track)? Is it possible to quantify these impacts? What could or should be done to mitigate such undesired impoacts? Removal should not interfere with train traffic, other than in special circumstances (very high trees etc). Removal might reduce other railway risks (e.g. level crossing incidents) Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score: 2

9	**Impact on people and jobs** Consider people in and outside railway industry. How would implementation of the measure affect people and their jobs? Consider issues like loss of jobs, training and education, safety and health, number of staff needed, impacts on Staff / contractors will be needed for the initial clearance and regular maintenance of the vegetation. These may not be new job opportunities as it is likely that some work of this nature will be carried out for other reasons (signal sighting, adhesion and leaf fall reasons). Soem parts of the work may be seasonal. Clearing vegetation may provide more visibility and some reassurance for the train drivers. The work should be possible without increase in risk to staff. Removal may impact on privacy for some lineside neighbours. Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score: 2
10	**Technological issues** Consider following issues regarding necessary technology: Is it available and reliable? If not, is it likely that the situation will be improved in near future? Is it compatible with current infrastructure design and relevant standards? There should not be any technological issues affecting this measure. Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score: 2
11	**Environment** Consider issues like emissions, energy, scenery, wildlife, impacts on people near the track, short and long term effects. This measure could have effects on wildlife and scenery, with a slight risk on increase innoise nuisance to neighbours if dense vegetation is removed from the vicintiy of housing. The measures refer to physically cutting back vegetation and should not require the use of herbicides. Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score: 1
12	**Acceptance** Estimate how relevant groups of people (e.g. staff, passengers, train operators, infrastructure managers, people living near tracks) accept the measure? What are the likely reasons for non-acceptance? Explain the basis of the estimate(s). The greatest resistance could be from people living near to the track and environmentalgroups. Part of this could be mitigated with appropriate communication to neighbours. It might be diffcult to resolve some of the environmental concerns so indiscriminate removal of vegetation should be avoided. Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score: 1
13	**Transferability issues** What needs to be considered when applying the measure to another kind of environment (or country) or in different scale? What are the necessary preconditions for successful implementation of the measure in different environments or scale? How could the problems concerning transferability be solved? It is likely this that this measure could be transferred easily to other locations and countries, particularly if those with a good programme for clearance and regular maintenance were able to share best practice e.g. identification and control of this type of risk in high frequency locations, on costs, access arrangements and frequencies of clearance, dealing with neighbours and environmental concerns. Score: 2 = No problems, 1 = Only minor problems that can be solved, 0 = Major problems	score: 2
14	**Additional information** Describe any other relevant issues concerning successful implementation of the measure that are not mentioned above.	
	Total score	19
	Overall rating: 2= Recommended, 1 = Promising, 0 = Questionable	

Annex 4: An example of a performance matrix

Measure number	Title of measure	Type of measure	Countries where applied (or planned)	**Scores** (0, 1 or 2)														Total score	Recommendation (Recommended, Promising or Questionable)
				1. Description of the measure	2. Definition of target incidents	3. Size of the problem	4. Effect on incidents	5. Durability of effects	6. Costs and benefits	7. Integration with other policy measures	8. Impact on railway operations	9. Impact on people and jobs	10. Technological issues	11. Environmental issues	12. Acceptance	13. Transferability issues	14. Additional information		
1	Measure 1		UK, FI,…																
2	Measure 2		FR, IT,..																
3	Measure 3		SE, DE,..																
4																			
5																			