

Making the railway system
work better for society.

Final Report

Economic Steering Group – Task force on the assessment of ERA projects and its application on safety culture projects

Document History

<i>Version</i>	<i>Date</i>	<i>Comments</i>
0.1	24/04/2018	1st update of Intermediate Report (on the basis of feedback from the TF)
0.2	03/05/2018	2nd update of TF report (taking into account feedback from TF members)
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Introduction

The Economic Steering Group (ESG) Network Framework envisages the organisation of topic-based Task Forces in order to collect evidence on the outcomes of the various objectives from the Agency's work programme. In particular, the ESG Safety Culture Task Force was introduced as a mechanism to collect evidence on the **outcomes** of the Safety Culture initiatives from the Agency's work programme as well as indications regarding the link between the **outcomes and the final sector impacts**.

At the ESG meeting on October 18th 2017, it was agreed to organize the first Task Force as a pilot exercise focusing on the Agency's activities within the topic of Safety Culture. However, in the absence of experience and an established methodology to apply, this first task force effectively had two aims:

- 1) To develop a repeatable methodology (which can be applied to any area as required) which allows for a link to be established between Agency projects and economic or safety benefits.
- 2) To test the application of the methodology by assessing Agency interventions/projects in the area of safety culture. It is important to note that as most ERA safety culture projects had not yet been implemented, assessment of actual performance was difficult. Additionally, quantification and establishing causal linkages was challenging due to the nature of safety culture as an intangible benefits driver with limited consensus on its definition and scope. A challenging timescale of 3 months further created constraints on how much data and research can be gathered and analyzed.

This (pilot) Task Force report is therefore structured in two parts:

- **Part A** contains details on the developed methodology used by the Task Force along with a set of recommendations and lessons learnt during the pilot
- **Part B** follows the specified structure for the ESG Task Force reports, in particular:
 - Section B1: The Agency's Safety Culture Initiative: Description in the Single Programming Document (SPD)
 - Section B2: Identification of tangible outputs (linked to the Safety Culture Initiative)
 - Section B3: Effectiveness rating
 - Section B4: Stakeholder follow-on actions to SMS requirements
 - Section B5: Overall potential benefits from safety culture improvements
 - Section B6: Tentative quantification of Agency's SC programme value

This particular structure for this Task Force report was necessary in order to capture clearly:

- The developed methodology used for Safety Culture (it is the view of the SC Task Force that the methodology could in principle be applied to any area within the Agency's Work Programme)
- A set of recommendations identified during the course of the pilot

As such, it is expected that these elements will not be required for the next ESG Task Force.

Part A. Methodology

A1. Key principles

Some core principles were first agreed with the task force on the nature of Agency interventions and how they are identified and what their fundamental objective is. Figure 1 below shows how evidence of success of an initiative in a Member State or area leads to the policy approach of promoting that expected action/behaviour more widely across the EU.

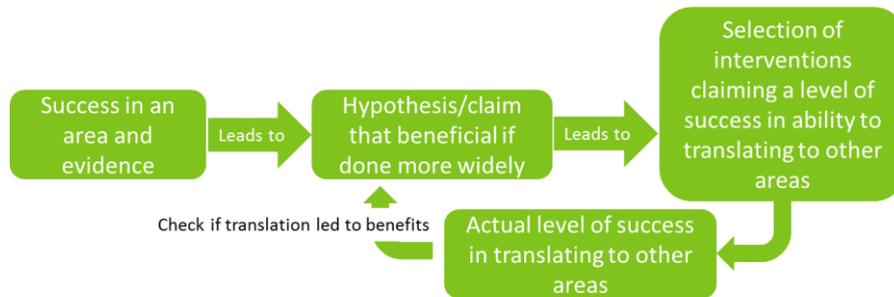


Figure 1: How an Agency intervention is/should be identified

Agency interventions should ideally originate from some evidence of a problem or opportunity where there is clear evidence of success because of an action (Practice proved to be good), as well as evidence of a lack of such actions in other areas/parts where a potential improvement in performance is envisaged if such good practice is also implemented. Figure 2 below illustrates the general set of questions (Q1 to Q4) an intervention’s (or project in ERA terms) evolution could logically follow, leading to the specifics of an intervention being developed (Q5) with actions/planned activities set out across the cells in the Q5 matrix as envisaged (Figure 3).

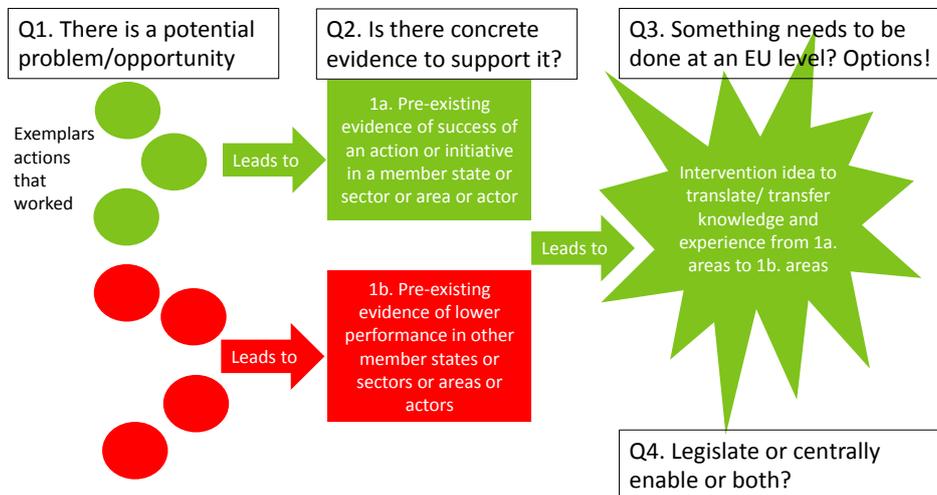


Figure 2: Key questions before defining an Agency intervention

Once the need for an intervention is established then the nature of the intervention needs to be agreed. The type of Agency interventions to aid the translation of good practice can be categorised as:

- 1) Codification in legislative documents and associated guidance, of expected actions aimed at NSAs, competent authorities and other legal entities,
- OR**
- 2) Centralized Agency action or output to enable (across member state, sectoral and organizational boundaries):
 - a. Increased awareness and competence

- b. Identification, measurement and evaluation
- c. Sharing of good practice and experience and collaboration
- d. Common reporting systems and mechanisms

Figure 3 below shows a matrix which was used by the task force to identify and categorize the nature of the intervention and the outputs that help achieve the intended project outcomes.

Q5. What is/has been the (likely or actual) effectiveness of the intervention in translating exemplar solution(s) knowledge and experience to other areas of improvement?

Level of centralised obligation imposition	Covered by a general higher level obligation and self assured	+ Specific obligation but still self governed/ assured	+ NSA monitoring of specific obligation	+ Independent formal certification/ assessment of specific obligation	+ Authorisation / Approval by state body of specific obligation actions
Enabling improved					
Awareness and competence via good practice promotion					
Identification, measurement & evaluation					
Sharing and collaboration across boundaries					
Formal reporting systems/ mechanisms					

Figure 3: Matrix for identifying the nature of the intervention

The Figure 3 matrix was used to categorize the tangible outputs identified by the task force and the Agency. The full flow chart can be found in Annex A but figure 4 below sets out the high-level actions that steered the task force’s discussions regarding the outcomes and final sector impacts linked to tangible outputs.

- › Determine workstreams of SC programme
- › Identify tangible outputs from workstreams
- › Categorise tangible outputs
- › Identify appropriate short-term outcomes
- › Scope for measurement of short-term outcomes
- › Identify mid and long-term outcomes
- › Scope for measurement: mid/ long-term outcomes
- › Possible quantification / monetization of B / C

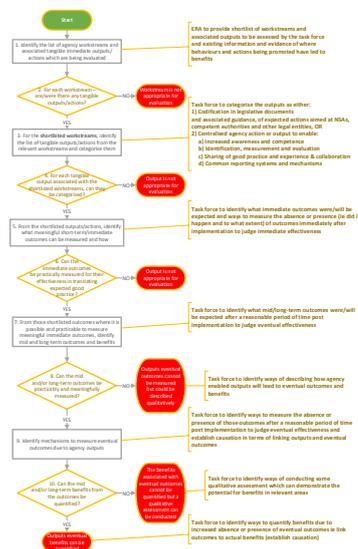


Figure 4: High-level actions for outcome measurement and quantification

The ESG task force identified a set of 10 tangible outputs (set out in section B1) for the projects for which the effectiveness can be measured. However, it was recognised that outputs work collectively (package effects) to achieve the objective of an Agency project and any assessment should be conducted at a project level using the impact of the tangible outputs as evidence to demonstrate how the project is affecting change in terms of immediate and follow-on actions from industry actors who will eventually improve safety culture in their relevant sector areas.

A2. Stages in outcomes measurement/quantification

The measurement/quantification method involved creating a benefits realisation chain with three stages:

- 1) **Stage 1:** Immediate assessment of effectiveness and impact due to an Agency project which would lead to follow-on actions from key actors being targeted by the project
- 2) **Stage 2:** Effectiveness of follow-on actions taken by actors being targeted due to effective immediate impact
- 3) **Stage 3:** Eventual impact on the sector’s performance due to effective follow-on actions taken by actors

The discussion of the task force led to the categorisation of Safety Culture interventions in three key categories in relation to the measurement model put forward, creating a benefits realisation chain with each category having the evidence of impact due to an Agency project activity, and then it is linked to the other categories. Figure 5 below illustrates the specific three stages from Agency interventions to actual benefits.

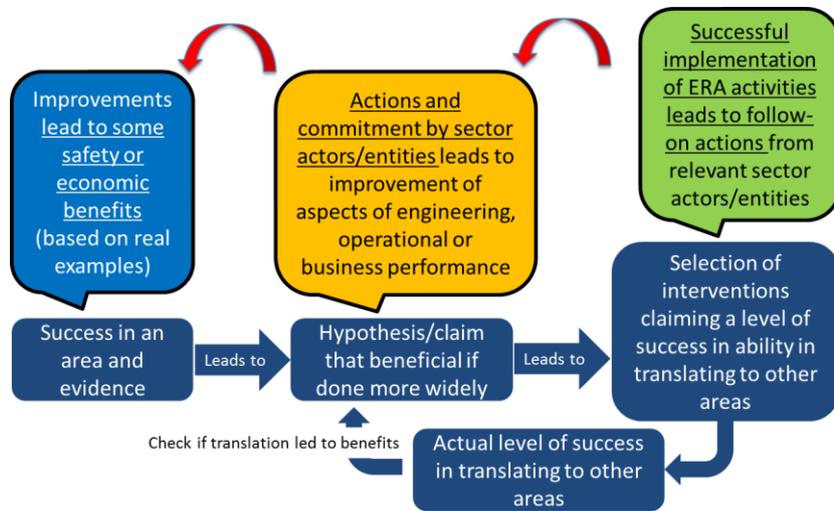


Figure 5: The three benefits realisation stages from Agency actions to actual benefits

The **stage 1** - green box/category sets out short to mid-term outcomes as a result of Agency activities (within a project) which lead to increased activity by targeted actors in the area of safety culture. It is essential that the activities within an Agency project lead to some short to mid-term actions which are measurable otherwise the ability of an Agency project to claim benefits further down the benefit chain is severely depleted, i.e. if no short to mid-term benefits can be evidenced then no claim can be made around safety or performance improvements as a result of the Agency’s activities or projects.

Stage 1 on the benefits realisation chain is assessed on five dimensions (for each Agency project), each with a five-point scale where 5 represents highest expected performance and 1 represents low performance. The five dimensions are generic and applicable to any project.

The Agency must demonstrate the expected immediate effectiveness of the project using the five dimensions, setting out a clear Target statement, and how a rating of 5 will be achieved and how will that be measured. The aim is to demonstrate through the rating and the associated evidence and explanation

(narrative) on how a rating of 5 - successful performance/target objective will be achieved (or can be achieved), and what a rating of 1 - poor performance/target objective will not be achieved. The intermediate ratings 2, 3 and 4 are then relative measures of whether the expected outcome was closer to 5 or 1.

Next, the explanation of each of the five dimensions is provided. The Agency can use the dimensions and the ratings to describe what needs to be achieved to get a rating of 5 for the project using the outputs identified. The outputs can be combined or modified but should be used to evidence the basis of the rating.

The Agency experts should also identify how evidence of the actual performance of the project will be collected/identified (how this will be measured) post-delivery and implementation of the project. A rating system underpinned by evidence which then does not lend itself for measurement would not work at a practical level. In such cases, clear proxy alternative measures should be identified as necessary.

The five dimensions are:

- 1) **Range of actors targeted (for example, 5 = All relevant areas and actors were covered and 1 = Critical areas and actors were not covered):** This rating is to assess how the project (in order to achieve its stated objectives) has/is planning to cover all areas and actors. *For example, for a guidance document published by the Agency, the test would be whether it is aimed at the right audience and if they will have access. Similarly, for a conference it will be about if the right people have been invited to the conference and if they will be able to attend such a conference. Please note that if instead of actors (IMs, RUs, NSAs, etc.) there is a better descriptor such as geographical areas, e.g. member states, etc. then that is also acceptable. However, the key assumption is that due to Agency projects someone else is expected to do something.*
- 2) **Number of actors targeted (for example, 5 = Well above expected numbers of actors across all targeted areas were reached and 1 = Well below the expected numbers of actors across all targeted areas were reached):** This is a rating about identifying how many actors should the output reach in order for it to be considered effective in terms of sharing the knowledge as widely as possible. *For example, for guidance produced 5 could be – more than a 1000 downloads from the Agency website, and the guidance sent to more than 20 organisations across the EU.*
- 3) **Positive feedback of benefits from use of Agency outputs (for example, 5 = Across those that were covered and did get targeted, a high degree of awareness or understanding improvement was detected, and 1 = Poor or no evidence of improvement of awareness or understanding was detected):** This rating is about actual measurement of response from areas or people after the use or engagement with the Agency output or activity.
- 4) **Level of action or commitment triggered (for example, 5 = For those who were targeted, a high degree of follow-on action and commitment has been detected post-engagement with the Agency output or activity and 1 = Poor or no evidence of follow on action was detected):** This rating allows expected follow-on action (level of activity generated) to be measured and is a critical rating to claim further benefits along the benefit realisation chain. If very little follow-on action is detected, then it will be difficult to claim that the Agency activity or output had an impact. The rating should identify what is the follow-on action and how will evidence of it be identified. It is the evidence of the follow-on action that is critical for this rating, i.e. what do you expect to see/detect. For example, as a result of a guidance document a rating of 5 may be that all IMs have embedded the guidance in their SMSs. The actual measurement could be based on a short survey and feedback from the IMs.
- 5) **Extent of uniqueness in terms of whether follow-on action is due to the Agency (for example, 5 = Follow-on action is mainly due to an Agency project and 1 = Follow-on action is not due to an**

Agency project): This category is a confirmation of whether the follow-on actions being claimed as being the result of Agency actions can be attributed to the Agency, i.e. what is the unique value added by the Agency actions compared to what was already happening or would have happened anyway without Agency actions.

To assess if the Agency activity was effective in the green category (stage 1) of immediate benefits, and if it led to actions by actors (implications of which will be assessed in the orange/stage 2 category) can be illustrated by using a spider diagram, see below Figure 6 with some dummy data. The rating should be based on actual measured data. The rating scores across the 5 dimensions can be added to get an overall score out of 25.

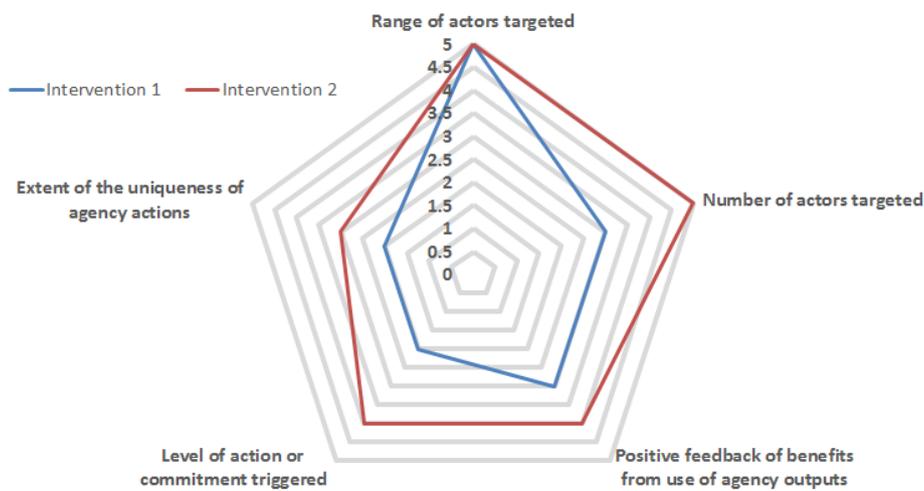


Figure 6: Intervention effectiveness spider diagram

The **stage 2** - orange box/category sets out evidence of whether the actions taken by actors targeted as a result (partially or fully) of the short to mid-term impact actually led to an improvement in safety culture in areas within the responsibility of those actors.

This assessment requires defining the spectrum/range of impact areas that the follow-on actions (by actors targeted by the Agency in the project) affect to realise the overall benefits to the sector. A suitable model or list of categories is needed to create the logical link between the follow-on actions that an Agency project foresees and actual improvements that lead to benefits being realised. For example, in the case of safety culture it was agreed that the 11 elements of the Safety Management System set out in the Safety Directive should be the target improvement areas (each with an assumed equal contribution to safety improvement).

Finally, the **stage 3** - blue box/category sets out the evidence of whether safety culture improvements (generally) lead to safety or economic benefits. Due to package effects and extraneous factors outside the control or influence of the Agency, it is very difficult to trace a safety improvement to a specific Agency activity within a specific Agency project, especially in an area as complex and subtle as safety culture. However, general evidence around safety culture investments or initiatives leading to improvements are

available in various sources such as research studies, accident and incident investigations, supervision reports, etc.

Once the Stage 1 and 2 benefits realisation assessment is completed and the expected follow-on actions are linked to actual safety and other benefits then the level of the contribution and the quantification becomes possible. The overall benefits that can be claimed by a project can be estimated or identified on the basis of general experience, case studies and existing data on key parameters.

Figure 7 below shows how the assessment of the three stages could be used in helping a project arrive at an estimated economic value of the potential benefits from a project. The boxes are colour coded to correspond to the green (stage 1 benefits realisation), orange (stage 2 benefits realisation), and blue (stage 3 benefits realisation) stages described in figure 5.

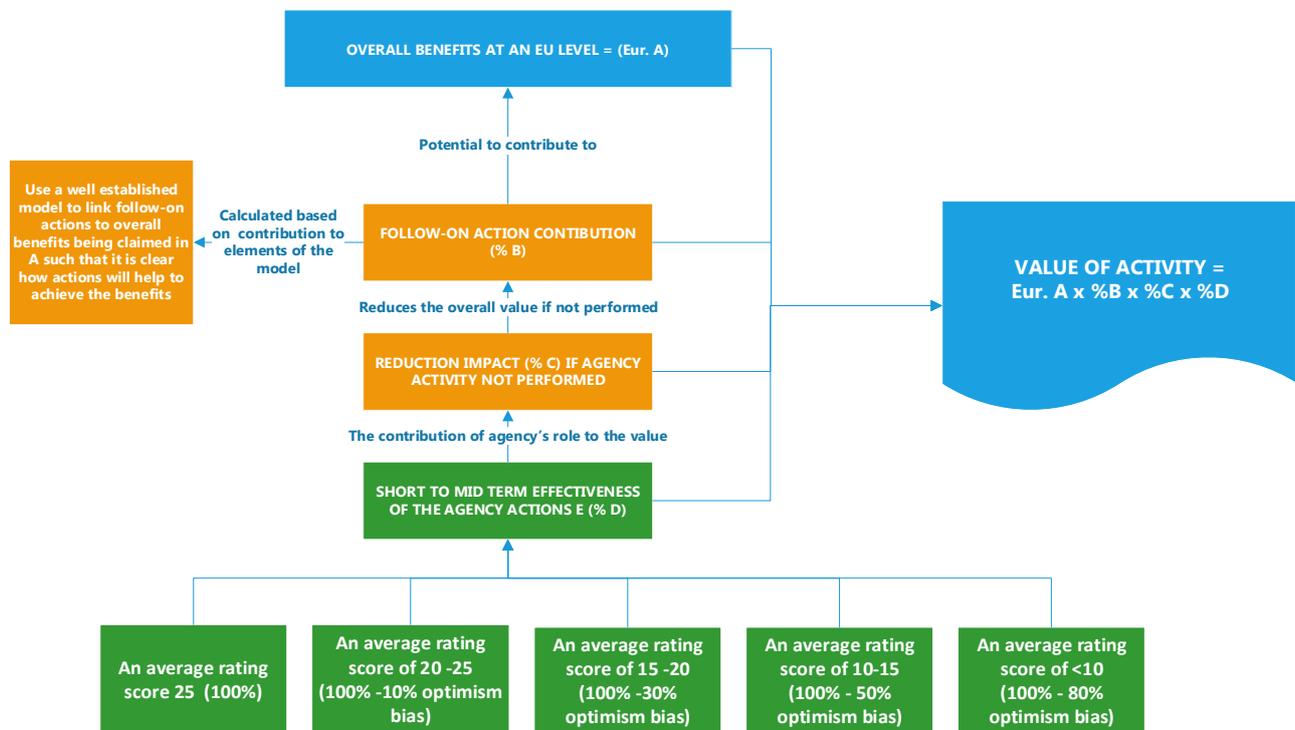


Figure 7: Calculating the potential benefits that could be achieved through Agency action(s)/project(s)

The stage 1 benefits realisation allows a project to be rated out of 25 and based on a score an optimism bias factor can be applied which effectively undermines the overall benefit claimed by the project as the score reduces. Figure 4 shows an optimism bias factor (D%) being applied based on the score. The selected ranges and associated scores shown here were subjectively agreed so can be changed as necessary to either apply universally to all Agency projects or derived for each individual project or area of work.

For stage 2 benefits realisation, the impact of the Agency action is estimated in Factor C%, while Factor B% is an estimate of the contribution of the follow-on actions towards actual improvement that could lead to a quantifiable economic or safety benefit.

Stage 3 benefits realisation requires the identification of a quantified performance measure/value (Factor A) which can be affected/reduced/improved if an improvement is delivered. This quantified value (ideally in EUR) can then be used to attribute a proportion of it to the relevant project activities based on ratings and estimates chosen for the particular project. These factors will be estimated ex-ante which can be validated ex-post with actual impact figures and evidence.

It is essential that it is recognised that any value estimated using the method is just an estimate and post project implementation assessment of 'what actually happened' should eventually supersede and validate the generic assumptions made at the beginning of the project.

A3. Advantages and drawbacks of proposed methodology

Below, consideration will be given to the advantages and drawbacks of the proposed methodology. In particular, the advantages of the methodology can be summarised as follows:

- › *Adds structure to the thinking*
- › *Extendable to other areas and repeatable*
- › *Generalization and ability to incorporate area specific thinking, models, etc.*
- › *Allows for short term comparisons within and across programs if required*
- › *Different assessment approaches and should work ex-post and ex-ante*
- › *Should allow for assessments to take place at different stages and time and still link together*
- › *Recognize limits to Agency actions and impact due to other actors*
- › *Simple to use which can cater for external subjective or objective input and can be underpinned by differing degrees of evidence and data*
- › *Allows for qualitative judgements to be made based on expert judgement and hard data when available*
- › *Can be used at output level, project or program/portfolio level*
- › *Acknowledge package effects especially mid and long term impacts*
- › *Process as important as the outcome (if not more important) as the assessment should feed into design of interventions and not only justify them after the fact*
- › *Does not replace impact assessments but supplements it (the IA validates the assumptions)*

Possible drawbacks are listed below:

- › *Assumptions have to be made about actions taken by actors targeted by the Agency activities*
- › *Requires very objective and clear cut short / mid-term impact statements which is not easy*
- › *Too conceptual and linking to tangible benefits is difficult*
- › *Links between follow-on actions and actual benefits is based on established models which may not have consensus or may not be developed*
- › *Values have to be based on robust data otherwise it may be perceived as guess work*
- › *It is a framework more than a specific approach but allows for area specific approaches*

Overall, it is considered that these advantages provide an important rationale for using and developing this methodology while taking into account the identified drawbacks. This conclusion is shared with the Economic Steering Group following the presentation and discussion of the report at the ESG meeting 16 May 2018.

Part B of this report is an application of the approach described above on safety culture ERA projects. Section A4 below highlights some general recommendations if the methodology used here is applied to other areas of the Agency's portfolio.

A4. Lessons learnt and recommendations for future ESG Task Forces

As part of the work of the ESG Pilot Task Force a series of lessons learnt and recommendations were collected and discussed among the members. Below, the key points are listed in order to facilitate the preparation of the next task forces.

- › *The approach is useful for identifying and assessing the potential value of Agency-led actions.*
- › *Developed methodology should be applied early on where a task force could contribute to challenge initial project ideas and validate the effectiveness ratings provided by the Agency. This would then facilitate the Agency's reflections on project definitions.*
- › *It was also perceived that it could be of relevance to use a task force later on when an Agency project is at a mature stage in order to check if the project's effectiveness has been optimised and more robust ex-ante analysis can be undertaken.*
- › *It was considered that the analyses undertaken by such a task force cannot easily be carried out within a working party setting. In particular, a key advantage of the task force format is the independent facilitation along with a broader approach of analysis by the TF members.*
- › *It was stressed that a critical success factor for a task force is linked to the selection of members, where it is important to have a balanced mix of competencies within the group.*
- › *It was perceived that a task force running for 3 months is challenging in order to deliver both a methodology and an application of the methodology. For future task forces careful and proportionate consideration to resources and timing should be in place taking into account that the methodology is now available.*
- › *As for the number of meetings (4), it was considered appropriate and could even include one additional meeting. Alternatively, it could be considered to have meetings of 2 days instead of 1 day in order to have sufficient time for in-depth discussions. Face-to-face meetings were preferred and necessary in order to progress sufficiently with the work.*
- › *The size of the task force was considered right in terms of facilitating exchanges among the members.*
- › *It would be important to set out clearly roles and responsibilities. In particular, the roles of the Agency relative to the Task Force are of importance. It could be relevant in this context to provide task force members with a briefing pack prior to the kick-off meeting.*

The lessons learnt and recommendations from the Task Force were presented to the Economic Steering Group meeting on the 16th May 2018. It was agreed that these points will be utilised for the planning and management of the next ESG Task Forces.

Additional aspects recommended by ESG participants to be taken into account for the next TFs included:

- › *Include visuals to display the outputs*
- › *Attempt to define, where possible, the expected effectiveness and compare it to the assessed effectiveness*
- › *Consider to coordinate the higher level across task forces ("blue box quantification")*
- › *Consider the use of discount factors and ensure consistency of these values across TFs*

Part B: Task Force Report on the assessment of Safety Culture ERA projects

B1. The Safety Culture Initiative in the Agency's Single Programming Document (SPD)

The Agency's initiatives in the area of Safety Culture (SPD 2018-2020) being examined by the ESG Task Force on Safety Culture are embedded in the programme '*Developing a common approach to Safety Culture*' comprising four specific projects:

- 1) **Project 1:** Raise awareness on Railway Safety Culture
 - › Share knowledge and promote an understanding among the authorities, RUs, IMs and other stakeholders about safety culture and Human and Organisational Factors.
 - › To create discussions with stakeholders about safety culture and how stakeholders, through their role and interfaces, influence other stakeholders' culture.
 - › To agree on common values of safety culture and the importance of a positive Safety Culture for an effective SMS
- 2) **Project 2:** Improve Railway Safety Culture
 - › Behaviour at each level of the risk regulation framework influences whether the total system outcome is safe or not. Systematically integrate 'Safety Culture Fundamentals' both in Agency products and services (for all Agency roles) and, with their collaboration, in stakeholder activities.
 - › To support stakeholders with the development and sharing of materials and methods.
- 3) **Project 3:** Enhance Just Culture (Effectiveness measurement already planned in 2020)
 - › Working with national prosecutors and railway experts – in collaboration with partners (Eurocontrol, and possibly other agencies):
 - › Give prosecutors an introductory knowledge about working in the railways and open up a discourse on just culture
 - › Train railway experts in just culture and to assist prosecutors in their examination of cases of railway incidents and accidents.
- 4) **Project 4:** Evaluate railway safety culture
 - › To design and implement a process to evaluate railway safety culture throughout Europe.

B2. Identification of tangible outputs

Applying the first step in the flowchart included as Annex A, tangible outputs have been identified and categorised under the four Safety Culture projects. The identification of tangible outputs is based on information provided in the Terms of Reference for each of the four projects along with discussions and clarifications during the meetings of the Task Force. Several iterations were undertaken in order to arrive at a robust list of tangible outputs. Below, the validated list of identified, categorised and tangible outputs is provided. Further details in terms of the categorisation is included as part of Annex C of this report.

In total, some **10 tangible outputs** have been identified across the four Safety Culture projects of the Agency. Overall, Annex C shows clearly that the (tangible) outputs cover categories at the lower spectrum of enabling / legal obligation imposed. As such, these outputs do not involve an attempt to legislate / regulate at European level. Furthermore, Annex D provides detailed information about each of these outputs in terms of relevant short, mid and long-term outcome measures. This information has been used to inform the rating of the Agency's Safety Culture projects.

In particular, the list of tangible outputs are:

Project 1: Raise Awareness on Railway Safety Culture

1. **Output 1.1.** Safety culture and HOF conferences which will lead to key tangible deliverables: a) safety culture materials and online content b) Practical tools and examples stakeholders can use in the work in their organisations
2. **Output 1.2.** Facilitating groups and discussions in order to promote a shared understanding of Safety culture
3. **Output 1.3.** Railway leaders to sign a safety culture declaration/pledge (general promotion of sign-up to the pledge and creating a possible support to NSA for local promotion of pledge and associated data collection)

Project 2: Improve Railway Safety Culture

4. **Output 2.1.** Safety Culture Fundamentals workshops delivered which will lead to key tangible deliverables: a) A list of documented “Safety Culture Fundamentals”; b) Material to run specific in-house and/or external SCF workshops to identify SC impact of activities, products, services; c) Identify steps to integrate a specific Safety Culture Fundamental(s) within organisations
5. **Output 2.2.** A complete “Safety Leadership” training package for individual companies
6. **Output 2.3.** Training on in-depth accident investigation, integrating HOF and safety culture elements, on demand of the NIBs at the network meetings
7. **Output 2.4.** A specific guide on how to integrate safety culture into NSA supervision activities, in the context of the new CSM on SMS

Project 3: Enhance Just Culture

8. **Output 3.1.** Workshops and training courses for the judiciary and railway experts
9. **Output 3.2.** Repository web-site with information on Just Culture covering all modes

Project 4: Evaluate Railway Safety Culture

10. **Output 4.1.** Appropriate process to evaluate railway safety culture in Europe

It should be noted that the Task Force decided not to consider further Output 4.1 as the outputs of the project are not fully defined at this stage since this project is undertaken late in the Agency’s programme on Safety Culture (towards 2023-24). The Task Force decided that the project and its output are not mature enough to be considered for assessment at this stage.

In the next few sections, the various factors needed to quantify the benefits from the projects and their outputs will be estimated.

B3. Effectiveness rating [Factor D%]

For each of the three SC projects the possible highest and lowest levels (5 and 1 respectively) in terms of effectiveness will be set out for the five dimensions:

- › *Range of actors / areas covered (Dimension A)*
- › *Number of actors targeted (Dimension B)*
- › *Positive feedback of benefits from use of Agency outputs (Dimension C)*
- › *Level of action or commitment triggered (Dimension D)*
- › *Uniqueness of follow-on actions linked to Agency project (Dimension E)*

This section sets out the target statement/objective identified by ERA for each dimension. As safety culture projects have not been implemented yet it is not possible to give the project or its outputs a rating. Therefore, it has been assumed that a rating of between 3 and 4 (3.5) is a realistic achievement possibility for these Agency projects. **This would lead to an overall score between 15 to 20 thereby giving a factor D% of 70% when estimating the potential benefits from the projects in section B6 (see Figure 8 below).**

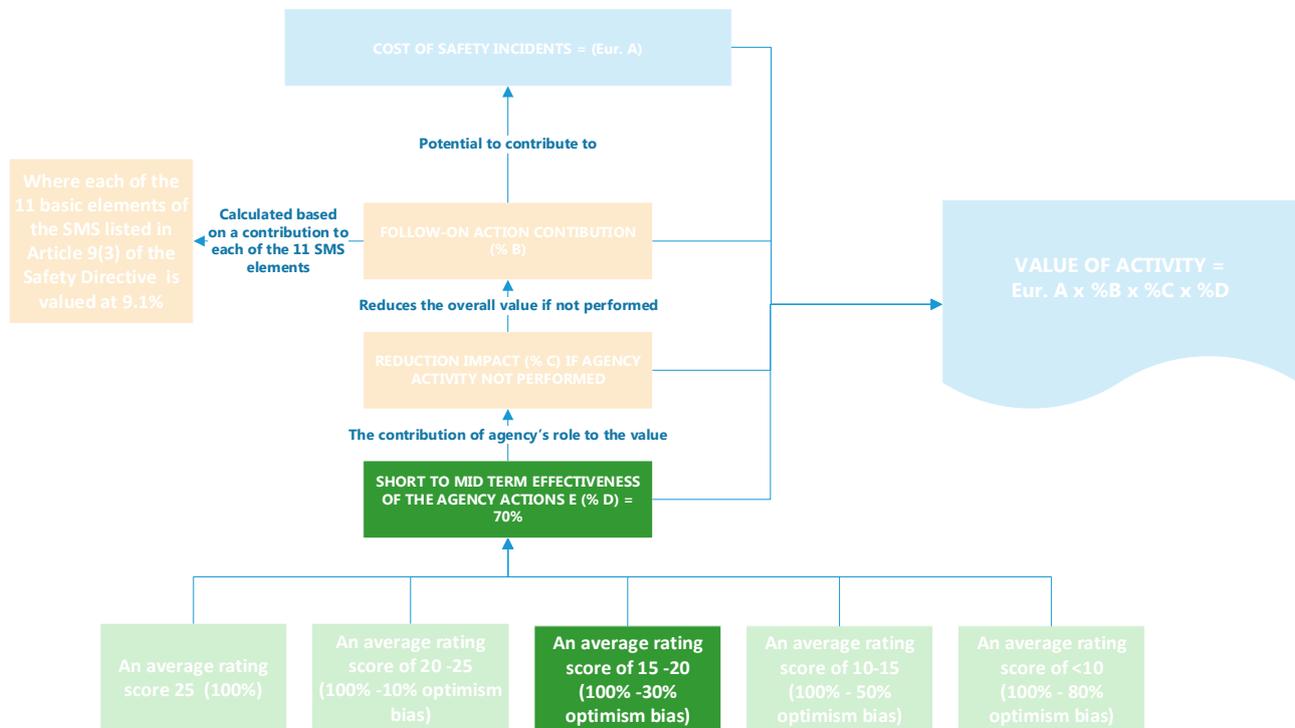


Figure 8: Effectiveness rating [Factor D%]

The target statements for each project and dimension are described next. It should be noted that these statements and the corresponding ratings are preliminary and subject to further refinement.

Project 1: Raise Awareness on Railway Safety Culture

A - Range of actors targeted (for example, 5 = All relevant areas and actors were covered and 1 = Critical areas and actors were not covered)

Target statement: To raise awareness, share knowledge and promote an understanding among the authorities, RUs, IMs and other stakeholders about safety culture + human and organisational factors. Potentially, this would concern all with an active and/or regulating role in the European railway system + NO

and CH (EC, Agency-units, NSAs, NIBs, Notified Bodies, RUs, IMs, ECMs etc.). The Networks (NSA, NIB, NRB and especially HFN) are important stakeholders for this project

- **Rating of 5 = All actors identified in the RSD across the whole of Europe have been reached by the project**
- **Rating of 1 = Only the Networks (NSA, NIB, NRB and HFN) + the Agency**

B- Number of actors targeted

Target statement: To raise awareness, share knowledge and promote an understanding among the authorities, RUs, IMs and other stakeholders about safety culture and human and organisational factors. Potentially, this would concern all with an active and/or regulating role in the European railway system + NO and CH (EC, Agency-units, NSAs, NIBs, Notified Bodies, RUs, IMs, ECMs etc.). The Networks (NSA, NIB, NRB and especially HFN) are important stakeholders for this project

- **Rating of 5 = Over 80% of NSAs and RUs / IMs across Europe as well as the Agency are actively working on the subject of Safety Culture**
- **Rating of 1 = Less than 20% of NSAs and RUs/IMs without a geographical spread + Agency are actively working on the subject**

C - Positive feedback of benefits from use of Agency outputs:

Target statement: Positive feedback from over 80% of those that engaged with the Agency or received/used relevant material

- **Rating of 5 =Achieved**
- **Rating of 1 = Not achieved**

D - Level of action or commitment triggered

Target statement: Follow-on actions as a result of Agency activities identified for over 80% of IMs and RUs

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

E – Extent of uniqueness in terms of whether follow-on action is due to Agency

Target statement: Agency content and activities clearly identified as fulfilling a key gap in awareness improvement activity within organisations engaged with in this project

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

Project 2 – Improve Railway Safety Culture

Given the diversity of scope per output within Project 2, it was decided that the rating would be undertaken at output level, from which averages can be calculated in order to determine the ratings at project level.

Output 2.1 - Safety Culture Fundamentals workshops delivered which will lead to key tangible deliverables

A – Range of actors targeted (for example, 5 = All relevant areas and actors were covered and 1 = Critical areas and actors were not covered)

Target statement: The project (Improve Railway Safety Culture) aims at actively driving change in the Railway Safety Culture through the systematic integrating of “Safety Culture Fundamentals” both in Agency products and services (for all Agency roles) and, with their collaboration, in stakeholder activities.

- **Rating of 5 =Achieved (All operational staff of the Agency are formally directed to integrate safety culture into their products and services)**
- **Rating of 1 = Not achieved (integration direction is limited to Safety Unit operational staff only)**

B- Number of actors targeted (for example, 5 = Well above expected numbers of actors across all targeted areas were reached and 1 = Well below the expected numbers of actors across all targeted areas were reached)

Target statement: The project (Improve Railway Safety Culture) aims at actively driving change in the Railway Safety Culture through the systematic integrating of “Safety Culture Fundamentals” both in Agency products and services (for all Agency roles) and, with their collaboration, in stakeholder activities.

- **Rating of 5 = Achieved (All operational staff of the Agency have integrated safety culture in their activities)**
- **Rating of 1 = Not achieved (integration is limited to Safety Unit operational staff only)**

C - Positive feedback of benefits from use of Agency outputs

Target statement: All operational staff of the Agency understand and provide positive feedback on benefits of integrating safety culture in their activities.

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

D - Level of action or commitment triggered

Target statement: All operational staff have evidence of how integration of safety culture in Agency products and services has led to improved industry performance

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

E - Extent of uniqueness in terms of whether follow-on action is due to Agency

- **Rating of 5 = Achieved**
- **Rating of 1 = N.A (no other organisation is undertaking similar training)**

Output 2.2 - A complete “Safety Leadership” training package for individual companies

A – Range of actors targeted (for example, 5 = All relevant areas and actors were covered and 1 = Critical areas and actors were not covered)

Target statement: Develop and deliver workshops to create awareness and improve “Safety Leadership” fundamentals within operational organisations (RUs / IMs) in the European Union + NO and CH.

- **Rating of 5 = All IMs and RUs are targeted (incl. incumbents and new entrant operators)**
- **Rating of 1 = Only RUs / IMs already involved in Safety Culture discussions are targeted**

B- Number of actors targeted (for example, 5 = Well above expected numbers of actors across all targeted areas were reached and 1 = Well below the expected numbers of actors across all targeted areas were reached)

Target statement: Develop and deliver workshops to create awareness and improve “Safety Leadership” fundamentals within operational organisations (RUs / IMs) in the European Union + NO and CH.

- **Rating of 5 = Over 80% of RUs / IMs across Europe are taking the training**
- **Rating of 1 = Less than 20% of RUs / IMs across Europe are taking the training**

C - Positive feedback of benefits from use of Agency outputs

Target statement: Positive feedback from over 80% of workshop attendees on quality of the workshop

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

D - Level of action or commitment triggered

Target statement: Follow-on action explicitly identified by over 80% of IMs and RUs who attended workshops with the Agency within 12 months

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

E - Extent of uniqueness in terms of whether follow-on action is due to Agency

Target statement: Content delivered is considered to add significant value by over 80% of attendees compared to relevant existing content available in their organisations

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

Output 2.3 - Training on in-depth accident investigation, integrating HOF and safety culture elements, on demand of the NIBs at the network meeting

A – Range of actors targeted (for example, 5 = All relevant areas and actors were covered and 1 = Critical areas and actors were not covered)

Target statement: High-quality and relevant training workshops on in-depth accident investigation, integrating HOF and safety culture elements, formally offered/made available to over 80% of all NIBs in the European Union + NO and CH, leading to interest in training expressed to ERA by the NIBs

- **Rating of 5 = Achieved (Example - Interest expressed by more than 80% of NIBs)**
- **Rating of 1 = Not achieved (Example - Interest expressed by less than 20% of NIBs)**

B- Number of actors targeted (for example, 5 = Well above expected numbers of actors across all targeted areas were reached and 1 = Well below the expected numbers of actors across all targeted areas were reached)

Target statement: High-quality and relevant training workshops on in-depth accident investigation, integrating HOF and safety culture elements, delivered to over 80% of all NIBs in the European Union + NO and CH

- **Rating of 5 = Achieved (Example - Over 80% of NIBs participated in dedicated training sessions with wide geographical coverage)**
- **Rating of 1 = Not achieved (Example - Less than 20% of NIBs participated in dedicated training sessions)**

C - Positive feedback of benefits from use of Agency outputs:

Target statement: Positive feedback from all those to whom training was delivered with clear improvement in awareness and improved understanding detected using before and after training surveys

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

D - Level of action or commitment triggered

Target statement: Follow-on action to act on the training explicitly identified by those who attended training and evidence of implementation is detected within 6 months of training across all NIBs who attended

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

E - Extent of uniqueness in terms of whether follow-on action is due to Agency (for example, 5 = Follow-on action is mainly due to Agency project and 1 = Follow-on action is not due to Agency project)

Target statement: Training and training content delivered is considered to add significant value compared to relevant training delivered within the NIBs by over 80% of attendees the training via a post training feedback survey

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

Output 2.4 – A specific guide on how to integrate safety culture into NSA supervision activities, targeting NSAs in the context of the new CSM on SMS**A – Range of actors targeted (for example, 5 = All relevant areas and actors were covered and 1 = Critical areas and actors were not covered)****Target statement:** Develop a specific guide on how to integrate safety culture into NSA supervision activities, targeting NSAs in the context of the new CSM on SMS that is of relevance and useful for all NSAs

- **Rating of 5 = Guidance is appropriate to all NSAs**
- **Rating of 1 = Guidance is not appropriate to all NSAs**

B- Number of actors targeted**Target statement:** Develop a specific guide on how to integrate safety culture into NSA supervision activities, targeting NSAs in the context of the new CSM on SMS that is of relevance and useful for all NSAs

- **Rating of 5 = Over 80% of NSAs are using the guide in their work**
- **Rating of 1 = Less than 20% of NSAs are using the guide in their work**

C - Positive feedback of benefits from use of Agency outputs**Target statement:** Positive feedback from over 80% of NSAs on quality of the content

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

D - Level of action or commitment triggered**Target statement:** Follow-on action explicitly identified by over 80% of NSAs targeted by the guide within 12 months of the publication

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

E - Extent of uniqueness in terms of whether follow-on action is due to Agency**Target statement:** Content delivered is considered to add significant value by over 80% of NSAs compared to relevant existing content available to NSAs

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

*Project 3 - Enhance Just Culture***A – Range of actors targeted (for example, 5 = All relevant areas and actors were covered and 1 = Critical areas and actors were not covered)****Target statement:** Working with national prosecutors and railway experts – in collaboration with partners (Eurocontrol, and possibly other agencies) (1) to give prosecutors an introductory knowledge about working in the railways and open up a discourse on just culture; (2) to train railway experts in just culture and to assist prosecutors in their examination of cases of railway incidents and accidents. In scope is just culture training of railway experts and judiciary from the Member States. Out of scope is any other “just culture in organisations” work, which is expected to be incorporated in the safety culture fundamentals.

- **Rating of 5 = Target on judiciary / railway experts with particular focus on RUs / IMs**
- **Rating of 1 = Target what Eurocontrol proposes**

B- Number of actors targeted (for example, 5 = Well above expected numbers of actors across all targeted areas were reached and 1 = Well below the expected numbers of actors across all targeted areas were reached)**Target statement:** Working with national prosecutors and railway experts – in collaboration with partners (Eurocontrol, and possibly other agencies) (1) to give prosecutors an introductory knowledge about working

in the railways and open up a discourse on just culture; (2) to train railway experts in just culture and to assist prosecutors in their examination of cases of railway incidents and accidents. In scope is just culture training of railway experts and judiciary from the Member States. Out of scope is any other “just culture in organisations” work, which is expected to be incorporated in the safety culture fundamentals.

- **Rating of 5 = Achieved (Over 80% of Members States have been covered)**
- **Rating of 1 = Not achieved (Less than 20% of Member States have been covered)**

C - Positive feedback of benefits from use of Agency outputs

Target statement: Positive feedback from over 80% of those engaged with clear improvement in awareness and improved understanding detected using before and after training/engagement surveys

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

D - Level of action or commitment triggered

Target statement: Follow-on action explicitly identified by over 80% of those who engaged with the Agency within 6 months of first contact

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

E - Extent of uniqueness in terms of whether follow-on action is due to Agency

Target statement: Training and training content delivered is considered to add significant value by over 80% compared to relevant training delivered within the organisations ERA engaged with

- **Rating of 5 = Achieved**
- **Rating of 1 = Not achieved**

B4. Stakeholder follow-on actions to SMS requirements [Factor B%]

On the basis of the identified ratings for follow-on actions with respect to the three projects of the Agency’s Safety Culture programme, these will be mapped onto the basic elements of the Safety Management System (SMS) for RUs and IMs as established in the Safety Directive (Article 9(3)). The particular aim is to identify with a clear rationale which of these basic SMS elements will be strengthened as a result of follow-on actions / commitments linked to the Agency’s Safety Culture projects / outputs. In turn, the potential strengthening of these SMS elements can then establish a proportionate claim for safety culture improvement. In total there are 11 basic elements of the SMS listed in Article 9(3) of the Safety Directive as follows (each of these are assumed to provide a 9.1% contribution to safety culture improvement):

1. A safety policy approved by the organisation's chief executive and communicated to all staff;
2. Qualitative and quantitative targets of the organisation for the maintenance and enhancement of safety, and plans and procedures for reaching these targets;
3. Procedures to meet existing, new and altered technical and operational standards or other prescriptive conditions as laid down in TSIs, national rules referred to in Article 8 and Annex II, other relevant rules or authority decisions;
4. Procedures to assure compliance with the standards and other prescriptive conditions throughout the life cycle of equipment and operations;
5. Procedures and methods for identifying risks, carrying out risk evaluation and implementing risk-control measures whenever a change of operating conditions or the introduction of new material imposes new risks on the infrastructure or the man-machine-organisation interface;

6. The provision of programmes for the training of staff and systems to ensure that the staff's competence is maintained and that tasks are carried out accordingly, including arrangements with regard to physical and psychological fitness;
7. Arrangements for the provision of sufficient information within the organisation and, where appropriate, between organisations of the railway system;
8. Procedures and formats for the documentation of safety information and designation of procedure for the configuration control of vital safety information;
9. Procedures to ensure that accidents, incidents, near misses and other dangerous occurrences are reported, investigated and analysed and that necessary preventive measures are taken;
10. The provision of actions plans, alerts and information in the event of an emergency, agreed upon with the appropriate public authorities; and
11. Provisions for recurrent internal auditing of the safety management system

Annex F sets out how the follow-on actions from each output could be linked to improving the specific SMS elements. These can be aggregated to get a project level contribution. It was not possible to complete this task in the duration of this pilot study but the aggregated results will allow for estimation of Factor B (referenced in figure 7 in Part A) and quantify to what extent the actions can lead to actual improvement benefits. To progress with the assessment, a general assumption that follow-on actions from the rail sector in safety culture improvement will in turn improve each dimension by 2.3% leading to an overall 25% improvement potential value which is used to arrive at the benefit quantification in section B6. Figure 9 below sets out how factor B fits into the overall benefits quantification approach.

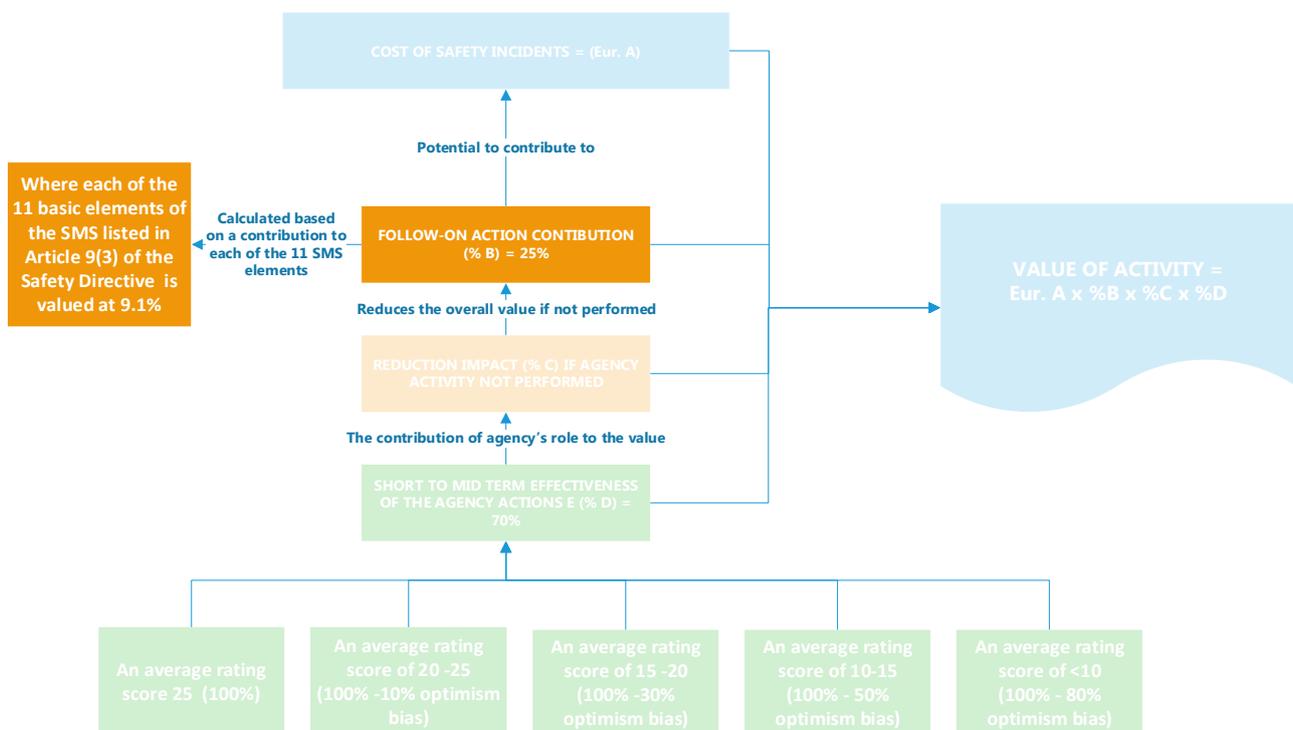


Figure 9: Measurement of contribution from stakeholder follow-on actions [Factor B%]

B5. Overall potential benefits from safety culture improvements [Factor A]

This section outlines the elements for possible quantification of potential benefits linked to the Agency's Safety Culture programme. As such, any quantification is challenging, especially in an area such as Safety Culture characterised by intangibles as well as uncertainties concerning the exact transmission from Agency initiatives to stakeholder actions that would deliver improvements in safety culture and in turn provide benefits for the railway sector and society.

Moreover, quantification of benefits will need assumptions about key parameters especially in an ex-ante assessment context. These challenges are being addressed through the application of the methodology by ensuring a transparent framework for quantification of benefits from Safety Culture improvements that can be repeated by different users and thereby facilitating early validation of the calculations. Below, selected available evidence of the possible gains from safety culture improvements are outlined. This evidence will be used to provide a baseline for any quantification linked to the Agency's Safety Culture programme. Subsequently, a preliminary quantification of the possible benefits in relation to the Agency's Safety Culture programme is put forward in below.

The ESG Task Force on Safety Culture has reviewed a range of evidence on the effects associated with safety culture improvements covering a range of different safety-critical industries incl. transportation in general and the railway sector in particular. In the following, key findings from selected (case) studies are outlined in order to identify order of magnitude figures of the possible benefits involved. The selection focussed on those (case) studies that involved railways (or transport) and / or were comparable to the initiatives being undertaken by the Agency. Further details about the selected case studies are included in Annex E.

RSSB (2015) contains a series of case studies illustrating how safety culture initiatives in terms of influencing organisational norms and behaviours can bring safety performance improvements as well as economic benefits. A selection of these case studies are included in Annex E of this report. Two illustrative findings:

- *Case study 1 (MTA Metro-North Railroad in US): This company implemented actions involving safety leadership training as well as enhancing safety processes such that employees had a broadened skill set and awareness in relation to safety culture. The outcomes included: a) 60% reduction in lost time injuries from 2002-2006; 81% reduction in lost work days from 2002-2006; c) increased on-time performance from 96% to 98.7% (all over a 4-year period). In particular, the 81% reduction in lost work days is noteworthy. The figure could easily be transformed into an estimate of economic benefits (using information about average labour costs per day times number of avoided lost work days).*
- *Case study 2 (Qantas): A series of interlinked initiatives were introduced encompassing among others: a) training of managers; b) systematic monitoring and evaluation of behaviours; c) proactive communication across the company. Outcomes identified over a 3-5 year time horizon included: a) Lost Time Injury Frequency Rate has reduced by 70% across the organisation; b) over 20,000 lost days are being saved annually; c) direct cost savings of \$500m predicted over 5 years (annual turnover of Qantas amounted to \$15.8bln in 2015, so savings roughly represents 0.6% of total revenue per annum).*

Bjørnskau and Nævestad (2013) provides a literature review to identify the association between safety culture and safety performance in the transport sector, i.e. how safety culture or safety climate relates to safety behaviour and in particular to accidents and injuries. The study covered aviation, rail, maritime and road transport. A main conclusion from the literature review is that there is fairly good evidence of the association between safety culture and safety performance in correlation studies and retrospective designs, in particular when safety performance is measured by use of self-reported safety behaviour. On the other hand the study found less support for the direct link between safety culture and accidents/injuries. However, this result seems to be dependent on whether the study is retrospective or prospective. In particular, for the

few prospective studies that exist the evidence seems to indicate that improved safety culture can indeed lead to reduced accident and injury rates. An overview of the studies reviewed for railways are included in Annex E.

NSA Sweden presented a case study involving the main freight operator, Green Cargo. The project is called "**Safe Habits**" based on knowledge from Behaviour Based Safety (BBS). It involved the creation of voluntary local groups composed of train drivers, operating staff and shunting yard staff. These groups are also supported by local teams of local managers, working environment staff and trainers. A Safe Habit is defined as being achieved when each staff in the local teams fulfil a "safe habit" during 21 consecutive days. Results from this project included significant reduction in the number of occurrences with associated cost savings of 4.5 mEUR in one year. Further details are included in Annex E.

Overall, the brief review of available evidence has confirmed that properly defined actions can lead to safety culture improvements that in turn can lead to significant safety and economic benefits. This provides a useful focal point for the quantification of the potential benefits of the Agency's Safety Culture programme.

For Factor A (Value placed by the railway sector, or Society, on the activity the commitments are enhancing or contributing to) several indicative measures could be of relevance, for example (all items would refer to a European level):

- *Costs for RUs / IMs of using the SMS (for EU as a whole)*

No precise data available (but could probably be estimated through questionnaires)

- *Costs for NSAs / NIBs for supervision / investigation*

Data for this key could be established through questionnaires and from the NSA annual reports

- *Operating costs, revenue or subsidy for RUs / IMs*

Costs 112 bln EUR (2012)

Steer Davies Gleave (2015) - Study on the Cost and Contribution of the Rail Sector

Revenue 77 bln EUR (2012); Steer Davies Gleave (2015)

Subsidy 35 bln EUR (2012); Steer Davies Gleave (2015)

- *Safety (accident / incident) related costs (based on the CSIs)*

1.65 bln EUR (2015)

European Union Agency for Railways (2016) Railway Safety Performance in the European Union 2016

The 1.65 bln EUR is the most conservative figure of all of the above and provides the most direct link to improvement of an IM and RU's SMS. Therefore, this figure is used for factor A in the context of assessing/quantifying possible benefits from safety culture improvements. Figure 10 below illustrates how factor A contributes.

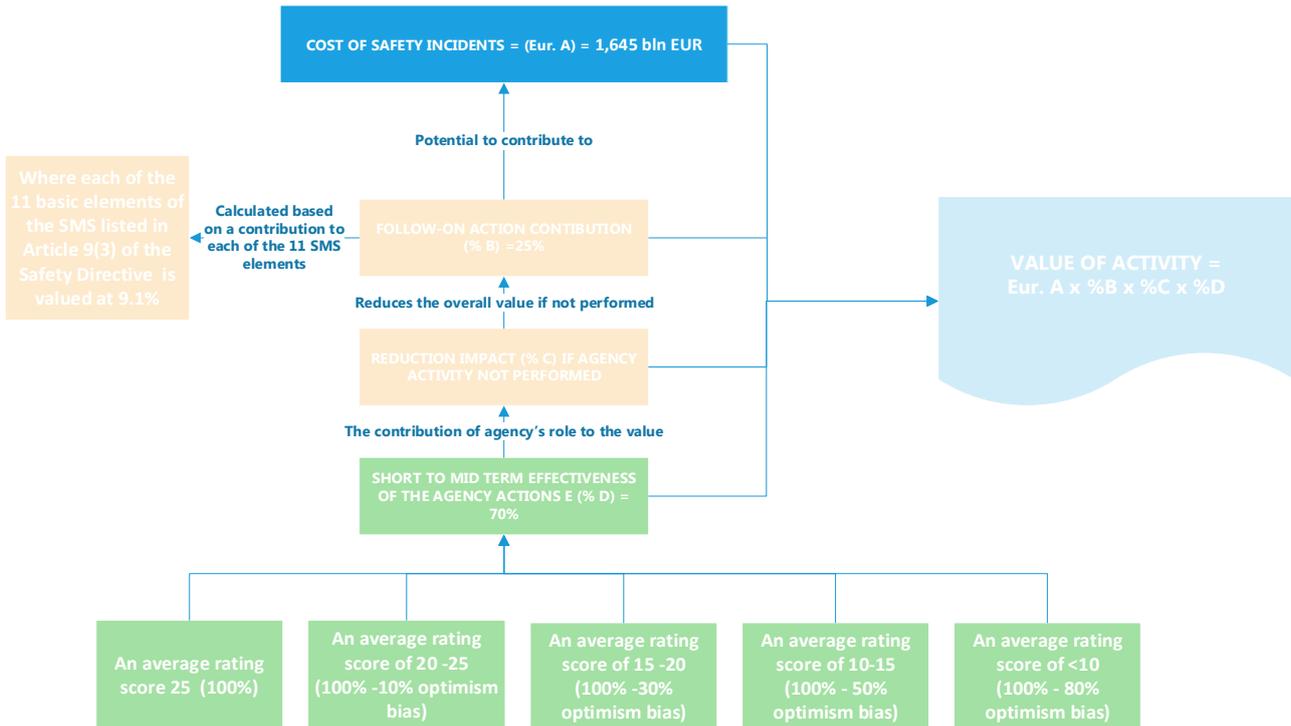


Figure 10: Value placed on Safety Culture improvements [Factor A]

B6. Tentative quantification of Agency’s SC programme value [Factor C and the overall benefits value]

Below, the logic of the estimated economic value model (figure 7 from Part A) is applied for the quantification of the Safety Culture programme. In particular, this will involve establishing the value of Agency action based on the multiplication of four components as follows:

- *The value placed by the railway sector (or Society) on the activity the commitments are enhancing or contributing to (Factor A in Euros)*
- *Commitment activities’ contribution to the value (A) – (Factor B as a proportion)*
- *Reduction impact if Agency activity is not performed (Factor C as a proportion)*
- *Short to mid-term effectiveness of the Agency activity (Factor D as proportion)*

The basis for the measurement of Factor D (Agency outcome effectiveness rating) is established by the elements put forward in Section B3. While Factors B and A were estimated in Sections B4 and B5 respectively. Factor C that is the improvement because of the contribution from the Agency activities could be assumed to be a very conservative 1%.

With these assumptions, the value of the Agency’s Safety Culture programme could then be estimated to be minimum (using the lowest value for Factor A):

1.645 bln EUR x 0.25 x 0.01 x 0.70 = 2.88 mln EUR per annum (rounded up to 3 mln EUR per annum)

Figure 11 below illustrates how the benefits estimate was arrived at using the model set out in Part A.

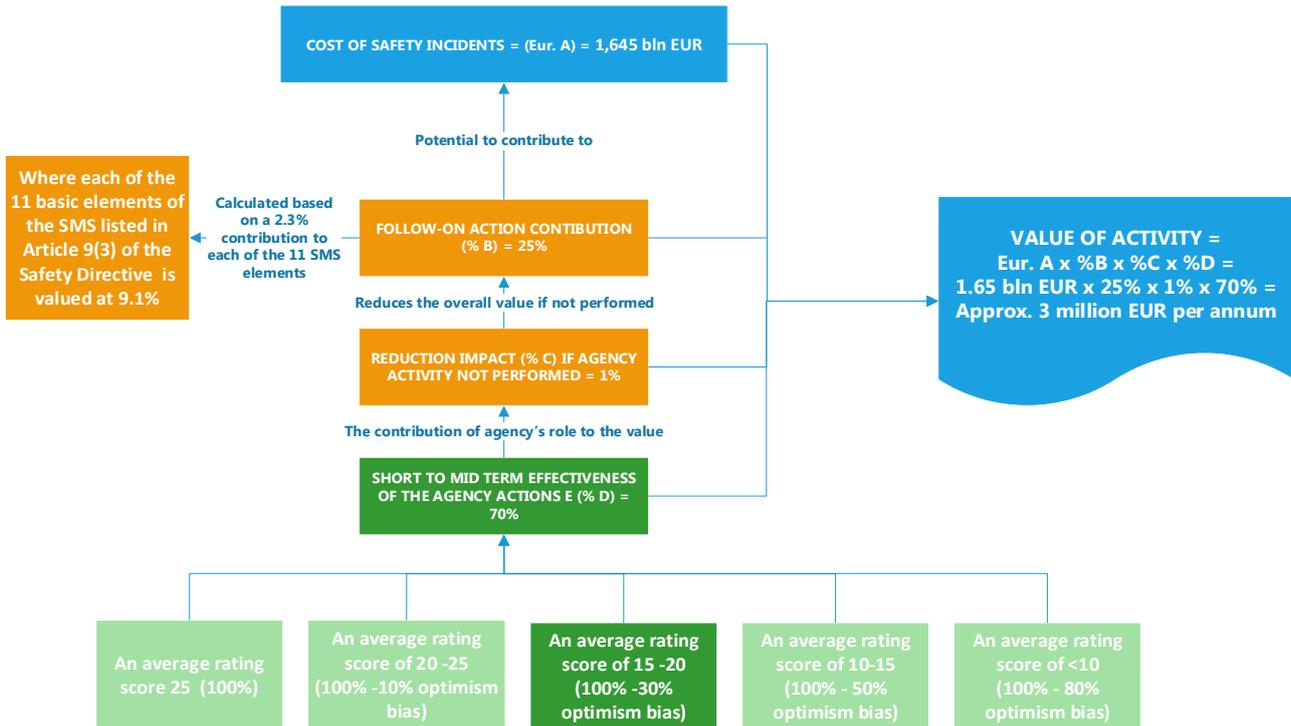


Figure 11: Synthesis of quantification of benefits from Agency's Safety Culture programme

Obviously, this estimate is dependent on the assumptions used for all factors (but the value suggested seems correct as an order of magnitude – note that this is likely to be a minimum estimate taking into account that other aspects than safety performance would be influenced by safety culture improvements).

This type of benefit calculation fits with the framework put forward in Annex B. In particular, the parameter 'Assumption on quantity, per year' corresponds to **factor A** (in the illustrated case – 1.645 bln EUR per annum). Similarly, the parameter 'Assumption on unitary costs and benefits, per year' would correspond to the product of **factors B, C and D**. The column recording 'Total cost / benefit M EUR, per annum' is then the product of factors A, B, C and D, i.e. equal to 3 mln EUR (in the above example).

As an additional dimension, the above calculation is undertaken with another measurement key for Factor A. In particular, the example will be linked to human resource cost for supervision (NSAs). Information about number of FTEs in one NSA dedicated to supervision was reported to be 9 per annum. On the basis of an assumption regarding average salary of 70 000 EUR per annum, the human resource costs would then be: 9 x 70000 EUR = 630 000 EUR. This figure could then be factored up to European level, e.g. using the ratio of population between EU as a whole and the country concerned resulting in a factor of 45. On the basis of these assumptions a European level figure for NSA supervision costs for human resources would then be equal to 28.4 mln EUR per annum. Using the same values for Factors B, C and D the Agency claim re. NSA cost savings for supervision linked to the Safety Culture programme could then amount to about 50 000 EUR per annum. This figure should be considered as additional to the 3 mln EUR reported above.

The findings of the Task Force regarding the Agency's Safety Culture programme is already being taken on-board by the Safety Culture team in their further reflections on the shaping of activities and outputs. Moreover, it is foreseen that the work undertaken by this Task Force will feed into the planned Agency led evaluations of safety culture within Project 4 of the Safety Culture programme.

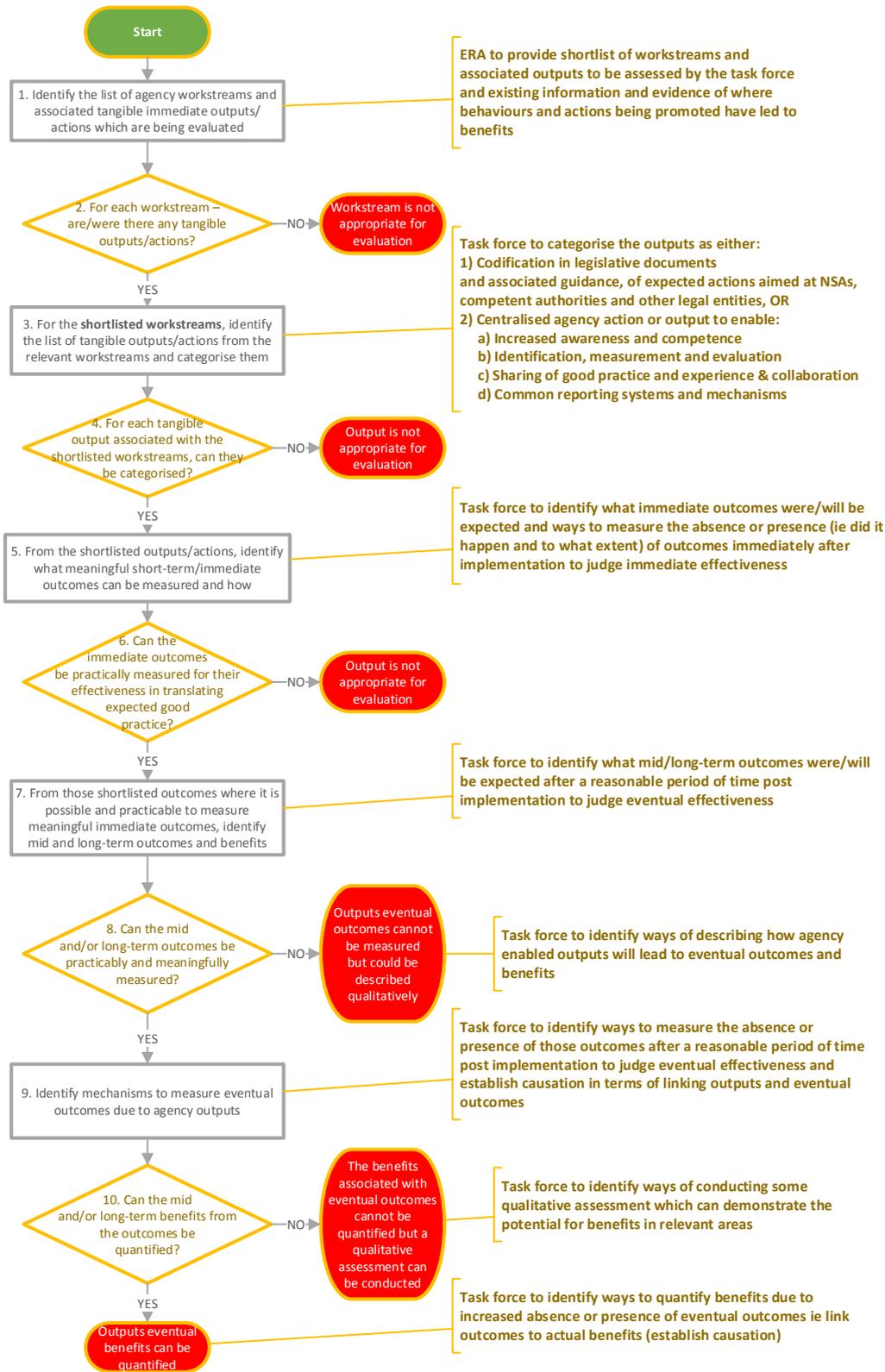
On the basis of this report, it will be possible to update the quantification of benefits based on actual measures of effectiveness achieved by the Agency along with updating the values used for the other parameters of the calculations.

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Annexes

Annex A: The task force approach to measurement/quantification



Annex B: Structure for the quantitative evaluation

SPD initiatives/ outputs	Intended outcomes	Costs and Benefits		Drivers and Sub-drivers	Period	Assumption on quantity, per year		Assumption on unitary costs and benefits, per year		Total cost/ benefit (M€)	Explanation of the Assumptions
						Value	Unit	Value	Unit		
Output 1.1. Output 1.2 ...	Outcome 1	Costs	Initial costs	Total (M€)	-	-	-	-	-	0	
					e.g. 2018	0		0		0	On quantity:
					e.g. 2018	0		0		0	On unitary cost:
			Recurring Costs	Total (M€)	-	-	-	-	-	0	
					e.g. 2019-2039	0		0		0	On quantity:
					e.g. 2019-2039	0		0		0	On unitary cost:
		Benefits	Total (M€)	-	-	-	-	-	0		
			Total (M€)	-	-	-	-	-	0		
				e.g. 2019-2039	0		0		0	On quantity:	
				e.g. 2019-2039	0		0		0	On unitary benefit:	
				e.g. 2019-2039	0		0		0	On quantity:	
				e.g. 2019-2039	0		0		0	On unitary benefit:	

Annex C: Categorization of Safety Culture outputs

Project 1: Raise awareness on Railway Safety Culture

Level of centralised obligation imposition	Covered by a general higher level obligation and self assured	+ Specific obligation but still self governed/ assured	+ NSA monitoring of specific obligation
Enabling improved			
Awareness and competence via good practice promotion	1. Safety culture and HOF conferences which will lead to key tangible deliverables: a) Safety culture materials and online content b) Practical tools and examples stakeholders can use in the work in their organisations	3. Railway leaders to sign a safety culture declaration/pledge (general promotion of sign-up to the pledge and creating NSA support for local promotion of pledge and associated data collection)	
Identification, measurement & evaluation			
Sharing and collaboration across boundaries	2. Facilitating groups and discussions in order to promote a shared understanding of safety culture		

Project 2: Improve Railway Safety Culture

Level of centralised obligation imposition	Covered by a general higher level obligation and self assured	+ Specific obligation but still self governed/ assured
Enabling improved		
Awareness and competence via good practice promotion	1. Safety Culture Fundamentals workshops delivered which will lead to key tangible deliverables: a) A list of documented “Safety Culture Fundamentals” b) Material to run specific in-house and/or external SCF workshops to identify SC impact of activities, products, services c) Identify steps to integrate a specific Safety Culture Fundamental(s) within organisations	2. A complete “Safety Leadership” training package for individual companies 3. Training on in-depth accident investigation, integrating HOF and safety culture elements, on demand of the NIBs at the network meetings 4. A specific guide on how to integrate safety culture into NSA supervision activities, targeting NSAs in the context of the new CSM on SMS
Identification, measurement & evaluation		
Sharing and collaboration across boundaries		

Project 3: Enhance Just Culture

Level of centralised obligation imposition	Covered by a general higher level obligation and self assured	+ Specific obligation but still self governed/ assured
Enabling improved		
Awareness and competence via good practice promotion	1. Workshops and training courses for the <ul style="list-style-type: none"> • judiciary and • railway experts 	
Identification, measurement & evaluation		
Sharing and collaboration across boundaries		
Formal reporting systems/ mechanisms	2. Repository web-site with information on Just Culture covering all modes	

Project 4: Evaluate railway safety culture

Level of centralised obligation imposition	Covered by a general higher level obligation and self assured	+ Specific obligation but still self governed/ assured	+ NSA monitoring of specific obligation	+ Independent formal certification/ assessment of specific obligation	+ Authorisation / Approval by state body of specific obligation actions
Enabling improved					
Awareness and competence via good practice promotion					
Identification, measurement & evaluation	1. Appropriate process to evaluate railway safety culture in Europe				
Sharing and collaboration across boundaries					

Annex D: Summary of outputs and outcome measures

	Outputs	Short-term outcome measures	Mid-term and long term outcome measures
Output 1.1	Safety culture and HOF conferences with dedicated materials incl. online information per event Concrete practical tools / examples made available through events	Number of actors (per category) being targeted for events Number of participants per event Number of downloads of materials / practical tools Awareness improvement based on participant survey	Follow-up quantitative measurement of awareness among participants x months / years after event Measurement of awareness among persons in same organisations as participants Number instances where practical tools / examples have been used by organisations involved in events / downloaded materials Number of actions / commitments triggered by organisations that have been involved in events / downloaded materials / accessed tools
Output 1.2	Facilitating groups and discussions in order to promote a shared understanding of safety culture	Volume of stakeholders targeted Coverage of stakeholders targeted Awareness improvement	Sustained awareness of safety culture among stakeholders targeted Level of actions and commitments triggered
Output 1.3	Declaration covering seven key commitments regarding safety culture	Number of railway leaders targeted Number of railway leaders signing at Safety Conference; Number of online signatories Awareness of safety culture / change in safety culture understanding among signatories	Follow-up quantitative measurement of awareness among signatories (is the information retained?) x months / years after event Measurement of awareness among persons in same organisation as signatories (e.g. before-after survey)? List of actions taken with respect to each of the 7 commitments Measurement (e.g. self-assessment) of improvements over time regarding each of the 7 commitments

	Outputs	Short-term outcome measures	Mid-term and long term outcome measures
Output 2.1	Delivered SCF workshops incl. workshop materials and specific action plan for participating entities	Volume of actors targeted Coverage of actors targeted Awareness improvement	Sustained awareness for participating persons Awareness improvement for non-participating persons in participating organisations Commitments and actions triggered
Output 2.2	Delivery of "Safety Leadership" training package for individual companies	Volume of organisations targeted Coverage of organisations targeted (incl. number of persons enrolled) Awareness improvement Extent of organisations able to implement training workshops internally	Sustained awareness among persons enrolled in training programme Number of training events in companies triggered by participation in Agency training Number of commitments and actions triggered
Output 2.3	Trainings on in-depth accidents investigations, integrating HOF and safety culture elements, developed and delivered to participating NIBs	Volume of actors targeted Coverage of actors targeted Awareness improvement	Sustained awareness of HOF and safety culture elements as part of accident investigations Change in quality / depths of NIB investigations (measured at regular intervals) Commitments and actions triggered by participating NIBs
Output 2.4	Specific guide on how to integrate safety culture into NSA supervision activities	Level of awareness of guide among NSAs Proportion of NSAs that use the guide consistently in their supervision	Follow-up on level of awareness of guide Follow-up on use of guide by NSAs Awareness of guide by other stakeholders (RUs / IMs) Trigger of guide usage re. NSA recommendations / actions Actions taken by RUs/ IMs in response to NSA measures (linked to the guide)

	Outputs	Short-term outcome measures	Mid-term and long term outcome measures
Output 3.1	Workshops for prosecutors about working in the railways Training courses for railway experts in just culture	Number of prosecutors / railway experts targeted Number of prosecutors / railway experts covered Number of prosecutors in workshop with increased awareness of railway aspects Number of railway experts in just culture training courses with increased awareness	Prosecutors attending workshops with sustained awareness of railway aspects Railway experts attending training courses with sustained awareness of just culture Railway related cases taken by prosecutors where workshop information was used Projects with involvement of railway experts where information from training courses was applied
Output 3.2	Repository web-site with information sources on Just Culture covering all modes	Potential users being targeted Number of downloads of materials re. Just Culture Level of awareness about existence of web-site among potential users	Mid-term and long term awareness and use of web-site among potential users (Additional) actions taken by web-site users linked to Just Culture
Output 4.1 (this output and the linked outcomes will not be included in any quantification undertaken for the ESG Task Force on Safety Culture)	Developed appropriate evaluation process and the actual evaluation of safety culture using the process	The extent to which evaluation of safety culture (along with all the activities being undertaken as part of the evaluation) would lead to a change in awareness of safety culture among the sector and authority stakeholders	The extent to which an increased awareness of safety culture from evaluation would trigger actions / commitments by stakeholders at national level

Annex E. Case studies analyzed

I. Selected Case Studies from RSSB Report (2015) Safety culture and behavioural development: Common factors for creating a culture of continuous improvement (Appendices).

Case study 1 (p. 113, RSSB, 2015)

Company/Sector MTA Metro-North Railroad

What they did

- Training for line managers so that they could incorporate safety processes into their everyday jobs and learn critical safety leadership skills.
- Enhancing safety processes of each work group which gave employees a broadened skill set and awareness.
- Encouraging the organisation to receive and act on feedback.

Outcomes

- 60% reduction in lost time injuries from 2002-2006
- 81% reduction in lost work days from 2002-2006
- increased on-time performance from 96% to 98.7%

Source

http://www2.dupont.com/Consulting_Services/en_US/assets/downloads/MTA_Metro_North_Railroad_Case_Study.pdf

Case study 2 (p. 112, RSSB, 2015)

Company/Sector Qantas (Aviation)

What they did

'People Safe' initiative rolled out across the high risk/high cost divisions, which involved:

- Comprehensive assessment of Qantas' existing safety management performance.
- Managers received training through a series of interactive workshops, complemented by in-field coaching and mentoring.
- A safety review and management structure was introduced to drive and then report activity from all operations to the Executive Committee.
- Progress evaluations conducted regularly.
- Leading indicators developed to link leadership behaviours and skills to a reduction in injuries.
- Safety improvements communicated via divisional forums, Qantas News and the Intranet.
- Managers began talking to employees about safety as they conducted safety observation tours.

Outcomes

In less than 3 years, the following gains have been delivered:

- Lost Time Injury Frequency Rate has reduced by 70% across the organisation.
- Over 20,000 lost days are being saved annually.
- Workers compensation claims costs have reduced from 1.5% to 1.0%.
- A 500% return on investment.
- Direct cost savings of \$500m predicted over 5 years.

- Process improvements including greater efficiencies in workshops and significant reductions in solvent use.

Source http://www2.dupont.com/Consulting_Services/en_US/assets/downloads/Qantas_CaseStudy.pdf

Case study 3 (p.111, RSSB, 2015)

Company/Sector Birse Rail (Construction)

What they did

- Got support and involvement from MD.
- Provision of training.
- Creation of a supply chain manager.
- Implementation of the direct labour force.

Outcomes

- Reduced downtime
- ~ Reduction in management time in incident investigations
- ~ 69% reduction in accident frequency rate (AFR)
- ~ Improved competence
- ~ Improved relations

Source <http://www.hse.gov.uk/business/casestudy/birserail.htm>

Case study 4 (p. 119, RSSB, 2015)

Company Bombardier

Industry Rail

Culture or behavioural change intervention

JOMC engaged with Bombardier and provided significant training for senior managers, key Bombardier staff were trained to become lead trainers and JOMC behavioural interventions were introduced.

Date introduced 2005

How effective was the intervention

The frequency and severity of accidents rapidly declined. This improvement has been sustained and continues to this day.

Link http://www.jomc.co.uk/documents/library/doc_20091103112529.pdf

Case study 5 (p. 123, RSSB, 2015)

Company Swiss Federal Railways

Industry Rail

Culture or behavioural change intervention

Use an interactive workshop campaign that would help to change the safety culture of the company with the aim of improving safety.

Date introduced 2010

How effective was the intervention

Corporate safety target in 2009 showed a 26% improvement over the previous year and the number of incidences on the SBB network decreased'

Link http://www.motiv-ch.ch/texte/adrian_etter_0704_P_5_FP_Paper_UIC_Final.pdf

II. Bjørnskau and Nævestad (2013) – overview of railway transport related studies

Study	Sample	Safety culture measure	Safety performance indicator	Registration	Prospective?	Effect
Morrow et al. 2010	Rail maintenance	Survey	Safety behaviour	Self reports	No	Positive, direct
Itoh et al. 2004	Track maintenance	Survey (TMAQ)	Accident/ injuries	Registered	No	Positive, direct
Fed. Railr. Adm. 2003	Maintenance mech. service	Intervention (awareness /compliance) "5-alive"	Injury rates	Registered	Yes	Positive, direct
Fed. Railr. Adm. 2006	Rail carrier	Intervention Rule revisions	Incident rates	Registered	Yes	Positive, direct
Bjørnskau & Longva 2010	Tram and metro train drivers	Survey (GAIN)	Accidents Incidents Behaviour	Self reports	No	Positive and negative

III. Case study provided by NSA Sweden (Green Cargo – freight operator)*Project introduction*

- Project called "Safe Habits" based on knowledge from Behaviour Based Safety (BBS).
- In the field voluntary local groups created with train drivers, operating staff and shunting yard staff.
- The groups is supported by local teams of local leaders, working environment staff and trainers.

What happened

- Today there are 25 local groups in 21 different locations.
- Management team has created visit plans and regular meet the local groups and support them.
- "Safe Habit" is when each staff member in the local teams fulfils a "safe habit" during 21 consecutive days.
- During 2017 there were 104 "safe habits" registered.

Result

- Reducing large number of occurrences.
- Each type of occurrence have dedicated costs.
- During 2017 reducing occurrence costs with approx. 4,5 MEUR
- No short-time profit – Management need to have long- term view and continuous support to the teams in order to be successful

Annex F. Follow-on actions by stakeholders to improvement of Safety Culture dimensions

The table below could be used to gather the information on how follow-on actions by stakeholders are linked to improvement of Safety Culture dimensions

- *A rating scale from 1 to 5 could be used*
 - o *1 = no link between follow-on actions and improvement of Safety Culture dimension*
 - o *5 = strong (positive) link between follow-on actions and improvement of Safety Culture dimension*

	Safety policy approved by CEO Rating (1 to 5)	Rationale for rating	Qualitative and quantitative safety targets Rating (1 to 5)	Rationale for rating
SC Output 1 .1				
SC Output 1.2				
SC Output 1.3				
SC Output 2.1				
SC Output 2.2				
SC Output 2.3				
SC Output 2.4				
SC Output 3.1				
SC Output 3.2)				
	Procedures to meet standards Rating (1 to 5)	Rationale for rating	Procedures to assure compliance with standards Rating (1 to 5)	Rationale for rating
SC Output 1 .1				
SC Output 1.2				
SC Output 1.3				
SC Output 2.1				
SC Output 2.2				
SC Output 2.3				
SC Output 2.4				
SC Output 3.1				
SC Output 3.2				
	Risk assessment Rating (1 to 5)	Rationale for rating	Staff competencies and training Rating (1 to 5)	Rationale for rating
SC Output 1 .1				
SC Output 1.2				
SC Output 1.3				
SC Output 2.1				
SC Output 2.2				

SC Output 2.3				
SC Output 2.4				
SC Output 3.1				
SC Output 3.2)				
	Information provision Rating (1 to 5)	Rationale for rating	Documentation of safety information Rating (1 to 5)	Rationale for rating
SC Output 1 .1				
SC Output 1.2				
SC Output 1.3				
SC Output 2.1				
SC Output 2.2				
SC Output 2.3				
SC Output 2.4				
SC Output 3.1				
SC Output 3.2				
	Reporting of occurrences Rating (1 to 5)	Rationale for rating	Emergency management Rating (1 to 5)	Rationale for rating
SC Output 1 .1				
SC Output 1.2				
SC Output 1.3				
SC Output 2.1				
SC Output 2.2				
SC Output 2.3				
SC Output 2.4				
SC Output 3.1				
SC Output 3.2)				
	Audit of SMS Rating (1 to 5)	Rationale for rating		
SC Output 1 .1				
SC Output 1.2				
SC Output 1.3				
SC Output 2.1				
SC Output 2.2				
SC Output 2.3				
SC Output 2.4				
SC Output 3.1				
SC Output 3.2)				

Annex G. Definitions and abbreviations

Definitions

<i>Term</i>	<i>Definition</i>
Agency	The European Union Agency for Railways such as established by the Agency Regulation
Safety Culture	Safety culture refers to the interaction between the requirements of the Safety Management System, how people make sense of them, based on their attitudes, values and beliefs and what they actually do, as seen in decisions and behaviours. A positive safety culture is characterised by a collective commitment to manage major railway risks, understand workplace reality, cultivate a continuous learning environment and integrate safety into all business activities. Interacting, formalising, disseminating and reinforcing are the four enablers that help this culture to develop positively.
Agency initiative Output	Tangible products or activities or actions as a result (fully or partially) of an Agency initiative, aimed to transfer good practice to other areas and actors that could benefit from the implementation of that good practice.
Agency initiative Outcomes	The likely or achieved short-term and mid-term-term effects of an initiative outputs.
Agency initiative Impacts on the railway system	Variation in safety, operational performance or in efficiency related to any activity relevant to the railway system across the EU as a result (fully or partially) of an Agency initiative outcome (resulting in a variation of benefits and/or costs).

Abbreviations

<i>Abbreviation</i>	<i>Meaning</i>
ESG	Economic Steering Group
ERA	European Union Agency for Railways
HFN	Human Factors Network
HOF	Human and Organisational Factors
NIB	National Investigation Body
NRB	Network of representative bodies
NSA	National Safety Authority
SC	Safety Culture
SPD	Single Programming Document (for the Agency)
TF	Task Force