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TNO report

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D5.1 TORC Impact Assessment, Framework, Methodology and Validation Roadmap

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Summary

The report describes a methodology to evaluate the impact from TORC training. The presumed impact is primarily on resilience as a positive contribution to safety, but also on the presumed indirect impact on efficiency and overall operation. The report is designed to serve as a recommendation from the joint Saf€ra project. In the current version, it reflects a joint theoretical grounding, as well as the experiences and conclusions that can be drawn exclusively from the Dutch piloting activities as concluded by TNO. The report thus also describes a TORC Impact Assessment roadmap and evaluation measures to be used in order to utilize new piloting experiences. The overall outcome is a set of validated impact assessment measures providing companies with the tools to assess the impact of their own resilience investments, and measure the outcomes of this process. This is supplemented by a methodology for conducting the assessment process and thresholds for the measures so that organisations can benchmark their performance. The inclusion of generic measures ensures that the TORC Impact Assessment methodology can be carried out in the future for other resilience interventions and that the impact of their future implementation can also be assessed – thereby ensuring the legacy of the TORC project.

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1 APPROACH TO MEASURE THE IMPACT OF A RESILIENCE TRAINING

NOTE: In the current version, this report reflects a joint theoretical grounding, as well as the experiences and conclusions that can be drawn from the Dutch piloting activities as concluded by TNO. In a later version, the experiences from piloting activities in Norway (SINTEF) and France (Dédale) will be used to revise it, if necessary. Accordingly, the report also describes a TORC Impact Assessment roadmap and evaluation measures to be used in order to utilize new piloting experiences.

1.1 Introduction

This document describes the methodology to evaluate the impact of TORC training. TORC includes three levels: operational, management and integrated training. The TORC training is seen as an 'intervention' to improve resilient work behaviour'. The training and its content is described in D1.1 of the TORC project (SINTEF Report A27034 (2015)).

The objectives of work package 5 are to evaluate the TORC concept against a pre-defined set of validation criteria providing indication and feedback for its refinement and improvement. A set of evaluation criteria are described and measures are defined and used to validate the TORC concept during its use in the case studies, and to refine and improve the concept.

1.2 Background

The impact of a tool or intervention is not only determined by the nature of the intervention itself, but also by its implementation (Bates, 2004). There is no single, simple route to achieve meaningful impact of any implemented solution. Improved results for a department or organisation are never guaranteed, even if positive change is achieved. Implementing change through training is a good example of this. Transfer of training can be defined as the extent to which trainees are able to use effectively in their work situations the knowledge, skills and attitudes acquired during training (Barnard, Veldhuis & Van Rooij, 2001; Baldwin & Ford, 1988). Burke and Hutchins (2007) showed that only 50 percent of training activities produce a behaviour change. Blume et al. (2010) further define the positive transfer of training as the extent to which the learning that results from a training experience transfers to the job and leads to meaningful changes in work performance. This implies that positive transfer of training is more than a function of the training conducted in a training environment, the learnt behaviour must both be generalized for use in the work context and maintained over a period of time for transfer to have occurred (Baldwin, Ford & Blume, 2009). However, determining precisely what these effects of training are is a challenging task. Baldwin and Ford (1988) developed a model of the transfer process for training, that included training inputs, training outputs and conditions of transfer which Grossman and Salas (2011) adapted further. They identify in their work - factors related to trainee characteristics (cognitive ability, self-efficacy, motivation, perceived utility of training), training design (behavioural modeling, error management, realistic training environment) and the work environment (transfer climate, support, opportunity to perform, follow-up) that are all factors to consider in order to succeed with the transfer of training. As argued, trainees areinfluenced not only by a training session, but also by various

environmental factors. As a result, the direct effect of training interventions can be difficult to determine.

The difficulty in attributing training's impact is no less pronounced in the safety domain. Actually, it might be more difficult to measure and attribute it due to the increased number of variables at play in complex socio-technical systems (Delatour et al., 2014). The scope of D5.1 was not to negate the issues at play in assessing training's impact, nor to try to overcome the problems encountered by the entire safety sector. Instead, it aims to provide companies and safety managers with a set of practical tools that they can use to assess, insofar as possible, the impact of the implementation of the TORC training. A TORC Impact Assessment Framework has been developed to support assessment of TORC effectiveness. It includes 1) Questionnaires 2) Post training evaluation brief as well as specific resilience related instruments (i.e. TORC gaming artefacts, observation schemes, etc.).

1.3 TORC Impact Assessment Framework

The objective of the TORC project is to develop a training solution that enables companies to improve resilient work behaviour. The TORC Impact Assessment Framework focusses on both safety managers and operational decision-makers. It provides them with the means to assess whether the TORC training implementation have had any meaningful impact.

1.3.1 Target group

Safety managers usually have heavy workload. TORC impact assessment should therefore not be overly complicated or require additional training, as highlighted by the HSE (2006). If substantive training was required to initiate the process among safety managers and personnel, the TORC Impact Assessment Framework would fail in its objective. Nonetheless, the task of evaluating the impact of a resilience solution is not a superficial one. An evaluation framework therefore should not be simplified to the extent such that it lacks meaning or impact.

1.3.2 Evaluation Framework

Kirkpatrick's (1994) training evaluation model is a comprehensive evaluation framework that has an easily understandable organizing principle. This model, with a genesis in the evaluation of training impact, sets out four areas where the evaluation of intervention should be directed: reaction, learning, behaviour, and results. An overview of what each of these levels assesses is given in Figure 1 (below).

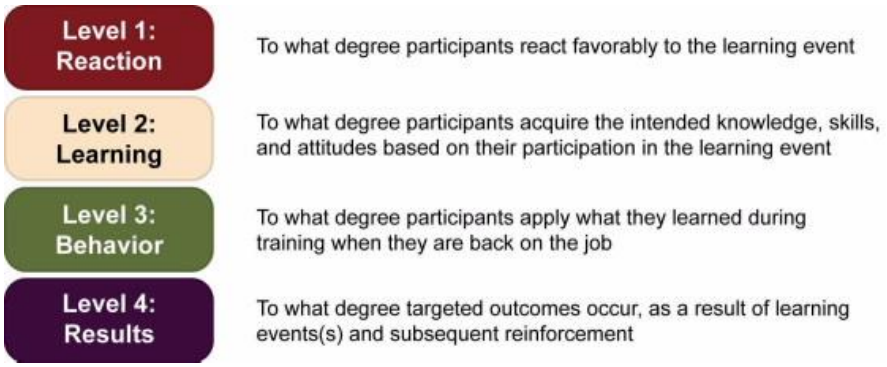

Figure 1 The Kirkpatrick Model (1994, based on the model first published in 1959)

Here, we outline the four levels based on so called 'new world additions'[1] which is an updated version of the model with the original definitions and new explanations:

Level 1: trainee reactions, that is, the:

- degree to which participants liked the training, believed it would help them with their job (customer satisfaction)
- degree to which participants are actively involved in and contributing to the learning experience (engagement)
- degree to which training participants will have the opportunity to use or apply what they learned in training on the job (relevance)

Reactions can be measured by assessing the personal appreciation of the training by trainees. This can be done in the form of a questionnaire.

Level 2: trainee learning, that is, the:

- degree to which training content was acquired by the trainees
- degree to which participants acquire the intended knowledge, skills, attitudes, confidence and commitment based on their participation in a training event
    - Knowledge: "I know it."
    - Skill: "I can do it right now."
    - Attitude: "I believe this will be worthwhile to do on the job."
    - Confidence: "I think I can do it on the job."
    - Commitment: "I intend to do it on the job."

Learning can be measured by examination. A written exam about what has been learned during the training is typically used to assess the acquired knowledge.

Level 3: behaviour on the job, that is the:

- degree to which learned behaviours are transferred to the job
- and supported by so called required drivers: processes and systems that reinforce, encourage and reward performance of critical behaviours on the job

Behaviour is typically measured by observation and assessing 'new' work behaviour. Trainers typically observe and evaluate the trainees' behaviour. The use of a checklist of items to be assessed increases the reliability of observation.

Level 4: results, that is, the:

- degree to which (teamwork) behaviours (or other targeted outcomes) enacted on the job as a result of the training event and subsequent reinforcement indeed produce improvements in safety/quality/resilience.
- measured by so called leading indicators: short-term observations and measurements suggesting that critical behaviours are on track to create a positive impact on desired results

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[1] http://www.kirkpatrickpartners.com/OurPhilosophy/TheNewWorldKirkpatrickModel/tabid/303/Default.aspx

Results are measured by looking at the overall outcomes of the learning and training. Results should be defined in measureable terms before the training starts. The focus is usually on a positive impact on pre-defined targets or results on different levels (team and organisational performance measures). The current learning goals of the TORC training can be summarized as follows:

- Experience of resilience in action in a simulated business practice
- Learn to deploy resilience as operational capability in dealing with unexpected changes and events during work related activities
- Explore and learn to apply strategies in resilient actions
- Explore and learn to deploy the company and other resources as support for changes in the work
- Experience the importance of relationships inside and outside your team to strengthen resilience
- Learn to reflect and evaluate how the positive and negative experiences with resilience in the future can contribute to a stronger operation
- Reassessing decision frameworks to establish space of manoeuvre

Sometimes a fifth level is used, the Return on Investment (Philips, 1997): what were the training costs and effort, what are the organizational (financial) benefits? However, this level will be disregarded here. For our purpose we adopt this four level model to identify and determine measures that enable the predefined target group to assess the degree to which training outcomes are reached on each of these levels for the developed TORC training.

The analysis and evaluation of any activity involving human action in a socio-technical system is a complex and involved task. Through decades of research, Kirkpatrick's model has proven sufficiently robust and has moved beyond just the evaluation of training interventions. It was therefore chosen as the model to inform the framework to assess organisational resilience investments and evaluate safety impacts.

1.4 Specification of TORC Impact Assessment Framework

Kirkpatrick's (1994) evaluation framework thus has four distinct levels, which we use to assess resilience interventions or resources:

1. Reaction - Assessing impact through the elicitation of perceptions and attitudes from the participants in the TORC training
2. Learning - Assessing impact through the elicitation of new knowledge, skills and learning from the participants in the TORC training
3. Behaviour - Assessing impact on the behaviour from the participants in the TORC training
4. Results - Assessing impact on the results that the organisation uses to evaluate its performance

Implicit in each level of assessment is an appropriate enquiry method. E.g., 'Reaction' and 'Learning' are best assessed by questionnaires/tests. Assessing impact of 'Behaviour' implies the observation of behaviour in a structured way to detect changes or the use of self assessment measurement tools. Assessing the impact on 'Results' implies focusing on KPIs (Key Performance Indicators - Leading Indicators) and organisational data. There is also an implicit focus of each category.

'Reaction' and 'Learning' focus on the individual, 'Behaviour' can be the individual or the organisation, whereas 'Results' is a more organisational, macro-level category.

In the evaluation context, the aim is to gain information about the impact of the training by using instruments that are appropriate for this. Starting with the right analysis methods the following three-pronged approach was chosen:

- Assessing impact through the elicitation of perceptions and attitudes of those impacted directly by the TORC training (Reaction & Learning levels, via a TORC questionnaire, plenary end of training evaluation. See section 3.1),
- Pairing these attitudes with behaviours (either physical real-time behaviours after the training during unexpected situations) or artefacts that demonstrate resilience behaviour during the training using work related problems (Learning & Behaviour levels, via targeted observations by expert/ peers and/ or trainer. See section 3.3 and 3.4), and
- Collating (and supplementing) organisational data on accidents, incidents and KPIs which focus on the 'hard' outcomes achieved (via document analysis, see section 3.2)

The TORC Impact Assessment Framework has three analysis methods and four levels of analysis. The questionnaire (targeting perceptions and attitudes) focuses on 'Reaction' (what do you think of this training), 'Learning' (what have you learned from this training), 'Behaviour' (what do you do differently as a result of the training), and 'Results' (what has this meant in terms of your job/role). Observations (linking attitudes and learning to behaviour) target just the 'Behaviour' category from Kirkpatrick's framework. This category is looking at collective or individual behaviour by observing it directly (to see how people are working, are they doing things correctly) or by observing indirect artefacts (or evidence) of behaviours. E.g., did the operational team members display resilience during the training? Organisational data is targeting the accident and incident data that the organisation will already collect and supplementing this with some additional metrics, which focus on results.

The approach taken in specifying the organisational metrics was to heed the advice of the HSE (2006) regarding the introduction of new safety indicators – insofar as possible the objective was to collate existing data rather than forcing safety managers to gather new, additional or even leading indicator data. This would require considerable research of the safety indicator literature which is far beyond the scope of this project. The metrics defined here, in line with the 'Results' orientation of this level of assessment were focused on typical safety/quality lagging indicators such as accident rates, incident rates, absenteeism, and other company specific data which were then supplemented by training-specific items. In the future it would be recommended to supplements these with leading performance indicators derived from the primary processes of companies that participate in the TORC training (in this project rail, oil & gas and air traffic control (ATC)).

Interventions can be assessed in different ways both quantitatively and qualitatively (Robson et al., 2001). Many studies use accidents as primary outcome measure. Accident data are typically expressed in terms of frequencies at the same time herein to process a measure of exposure. Often the number of hours worked (e.g.

105 or 106 hours worked) or the number of accidents per 1000 employees is used as exposure measure. With regard to the counting of accidents, there are several possibilities: lost-time injuries (more than 24 hours absence) notifiable accidents (accidents that should be reported to the authorities), first-aid accidents (accidents where personnel need to visit a first aid station), near misses or accidents (all the aforementioned types of accidents).

Accidents are, however, subject to various forms of distortion by the process of whether or not to report and record and therefore, are not always a reliable measure for determining the effect of an intervention. Robson et al. (2001) mention five "filters" that accidents pass through, as they move from one level (e.g. the reporter) to the next level (i.e. the direct manager). A "filter" is all that prevents the transition of relevant information from moving from one level to another. If few accidents occur then accidents are not a reliable indicator of success. Robson et al. therefore mention a number of other possibilities in order to determine the effect of interventions:

1. Other administrative data from accidents and reports; e.g. time between the accident and the formal notification, number of near-accidents (if they are retained), percentage of accidents for which action is taken (Amidi, et al., 2010;. Hale et al, 2010;. Nielsen et al. 2006).
2. Behavioural and workplace observations; keeping track of such observations is common in e.g. Behavior Based Safety (BBS) programs (Fellner & Sulzer Azaroff, 1984; Kines et al, 2010;. Saari & Näsänen, 1989; Sulzer Azaroff & de Santa Maria, 1980; and Zohar & Luria, 2003) (Barnard, Veldhuis & Van Rooij, 2001)
3. Questionnaire surveys; there is an extensive range of questionnaires available focused on perceptions, experience, detection, attitude, behaviors, self-reported accidents, etc. (Kines et al, 2010;. Nielsen et al., 2006; Rasmussen et al., 2006 , Zohar & Luria, 2003).
4. Audits; these can range from workplace inspections using a checklist, to extensive audits of (aspects of) the safety management system (Hale et al., 2010).

Since the TORC training focusses on improving resilience of the organization and its employees the assessment framework needs to go beyond the analysis of decreased accidents in time. Predefined KPI's should therefore be used to estimate if organizational changes in resilience and personnel and organisational awareness of the role of adaptations for solving unexpected situations or problems. This underlines the appropriateness of the TORC three-pronged approach focusing on assessing impact with various methods. Notwithstanding the issues associated with accident data these metrics are identified, together with information on other lagging factors and KPIs that give context to the accident data and the way in which improving resilience contributes to decreasing the number of incidents.

In Figure 2(below), a diagrammatic representation of the TORC Impact Assessment Framework is depicted, including the three analysis methods that are applied to evaluate the TORC training.

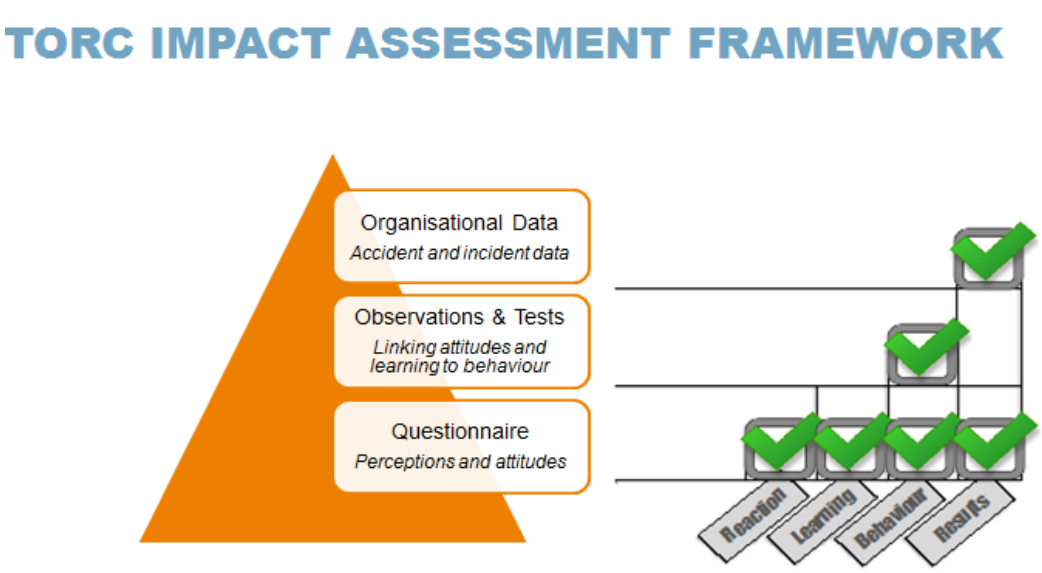

Figure 2 The TORC Impact Assessment Framework

1.5 Transfer enhancing variables and measures

Besides focusing on the (effects of individual) training inspired by Kirkpatrick, it is important to draw on other (contextual) factors that might influence or moderate the effectiveness of training when transferred to the working environment. This is depicted at the top of the model in Figure 3 as '*identify necessities for success*'. The impact of an intervention is not only determined by the effectiveness of the intervention (elements), but also due to determinants of its implementation (Bates, 2004). Important questions on how the training process can be modified in ways that increase its potential for effectiveness are:

- To what extent is the target audience exposed to all intervention components?
- Are all activities of the intervention implemented as planned?
- How are all the activities of the intervention appreciated by the target group?
- Can side effects be distinguished?
- What are impeding / facilitating factors for the implementation of intervention (parts)?
- Is the training program's success or failure a function of contextual factors such as proper equipment, adequate (training) resources, organizational culture, performance consequences, managerial expectations and support, or other key input factors?

Empirical research has detected several variables in recent years, which have a positive impact on the effectiveness of training (Robson et al, 2012; Chiaburu, Van Dam & Hutchins, 2010; Blume, Ford, Baldwin, Huang, 2010; Burke & Hutchins, 2007; Burke et al., 2006; Richman-Hirsch, 2001). Some variables can be influenced directly by the instructor or trainer. Most variables are only indirectly influenced by the trainer because they belong to the realm of the company. To make investments in employees through training more profitable, organizations must do more than just providing employees the opportunity to participate in training. Important factors are

the way instructors and managements supports participants to join training. They must use relevant problems or activities depicted from the real work environment in order to prepare them to conduct the desired work behaviour. In this, management has a crucial role. They are the key enablers to let participants transfer the acquired competences into their work environment. If the requirements and support are insufficient, the impact of training will be reduced.

1.6 Measuring the impact of interventions

The effect of the intervention has to be evaluated on the basis of effectiveness over time. Only then, it becomes clear whether the intervention is having the desired effect and the intended impact. The manner and timing must already be established at the start of the intervention program, and must be appropriate to the exact nature and extent of the intervention. The following factors should be considered when evaluating the effectiveness of interventions:

- Define beforehand exactly what behaviour is expected at what time and how that behaviour can be observed and measured.
- Consider a change of behaviour of all concerned, not only employees, but also direct-supervisors and senior management.
- Also, keep careful tracking of the number of incidents and accidents, so that the development of these values can be analysed in an evaluation.
- If the desired effect fails then adjust the intervention accordingly.

Several concluding remarks can be made:

- Allow time for *behaviour change* to take place.
    - The time is a difficult determination because change in behaviour may occur immediately after the program, or not until 3 months or 6 months after the program, or maybe never. The best compromise seems to be 3 months after the program.
- Allow time for *organisational results* to develop—perhaps 6 months or a year.
    - If enough resources are available, use a control group to have a better overview of the impacts of training. A “control” group consists of individuals who did not attend the training. An “experimental” group consists of the employees that participated the training. This is not very often realisable. However, organizations develop constantly and limitation of interaction between participants who did receive the training and who did not is not realistic.

The approach used within the TORC project therefore mirrors the one taken by Wang and Wilcox (2006) in further distinguishing Kirkpatrick’s four levels between short-term (reaction, learning) and long-term (behaviour, results) evaluation (i.e. the Q4TE approach, see Figure 3).

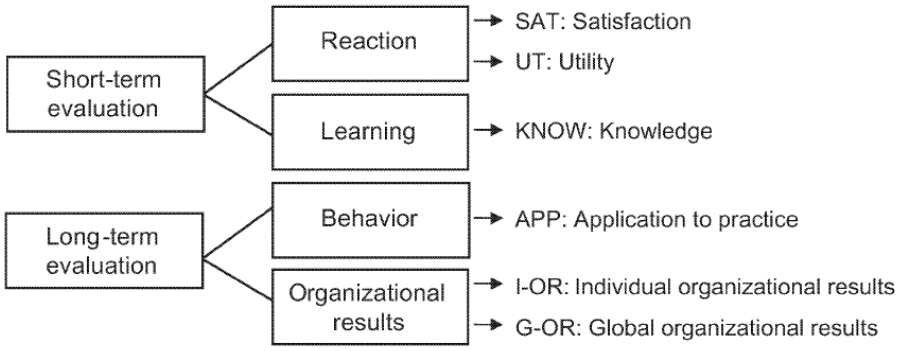

Figure 3 Scales of the Q4TE self-report measure (Grohmann & Kauffeld, 2013)

The Q4TE approach was loosely followed in the TORC (generic) evaluation framework including items and suggestions in the guideline for evaluating the four levels by Kirkpatrick (2006).

2 Validation and Finalisation of TORC Impact Assessment Framework

The finalisation of the development of the TORC Impact Assessment Framework require the involvement of the industrial stakeholders to validate and improve the framework in order to make it a useful instrument for the participating companies. The TORC Impact Assessment Framework has therefore been primarily evaluated during regular project meetings between research partners. The validation will be complemented and finalised in an iterative process, done remotely, via online teleconference meetings. The final version of the TORC Impact Assessment Framework will be the result of an iterative validation process between consortium partners, when all have acquired piloting experiences. The validation will be carried out by a multidisciplinary group of experts on the basis of specific guidelines and pre-identified criteria. The validation group will composed by TNO, Infraspeed*, Strukton Rail*, NAM*, Sintef and Dédale (*industrial stakeholders). TNO and Sintef will also be involved with the respective roles of task leader and task leader's supporter.

2.1.1 The Validation Process

The TORC Impact Assessment Framework is a result of a process which starts with the Framework development and ends with the validation of its thresholds. The validation workshop was designed and organised by TNO. The validation process is be synthesized through the following five steps:

1. The TORC Impact Assessment Framework as developed by TNO.

2. The consortium members evaluate all parts of the framework concerning the TORC intervention together with the generic part of the organisation metrics.

3. In the days following the evaluation session, TNO analyse the output of the validation. Some general and transversal feedbacks will be identified and highlighted. Many other section-specific comments will be reported and summarised in the comment area of the first version of the Framework. The first revision of the framework will be carried out by TNO that integrate and amend it accordingly.

4. In order to finalise the validation process, the amended framework will be subject to further email evaluation. The second version of the Framework will be shared with the validation panel by email and additional high-level feedback was collected. This email validation will be managed by TNO.

5. TNO refine and fine-tune the framework according with the few more comments received by email. This will constitute the final version of the TORC Impact Assessment Framework.

3 RESULTS – THE VALIDATED INSTRUMENTS

Chapter 3 depicts the instruments developed through TNO piloting activities. First, the developed questionnaire is described. Next, the observation scheme is elaborated. Finally, an overview of the proposed organisational data metrics is presented. Within the scope of this project only part of the evaluation method as described was used and tested given the timeline and scope limitations of the project. However, the whole method as described can be used by companies independently of this specific research project at a later stage (e.g. 3 to 6 months after implementation of the training).

3.1 TORC EMPLOYEE QUESTIONNAIRE

This questionnaire focusses on the 4 levels of the Kirkpatrick model and it is divided into two parts. Part 1 is given to participants directly after training. Part 2 is given 3-6 months after training to participants. Moreover, a Dutch translation of the questionnaire is available in Appendix A.

PART 1 TORC Questionnaire (reaction & learning) - Implement immediately after training

General information
• Time to complete: approximately 10 minutes
• Data remain anonymous

Instructions for completion
• Use a ballpoint pen
• In the box ☐ of your choice mark an X
• If you make a mistake:
'black-out' [■] the wrong box and put an X in the right box ☒
• Seal the completed questionnaire in the enclosed envelope and return it to the research team
• All completed questionnaires will be collected once the distribution is complete and will be analysed only
by the TORC research team who are bound by ethical guidelines for research with human participants

THEME	***Please provide on the following propositions to what extent you agree with the statement:***	**Strongly Disagree**	**Disagree**	**Agree nor disagree**	**Agree**	**Strongly agree**	**Do not know**
REACTION	This training is beneficial to my work	□	□	□	□	□	□
	This training will make the entire operation work better	□	□	□	□	□	□

	This training content is easy to integrate in my daily work	□	□	□	□	□	□
	The training approach (game) worked fine for me	□	□	□	□	□	□
	The training is in conflict with existing procedures or processes	□	□	□	□	□	□
	My job performance will improve through the application of the training	□	□	□	□	□	□
	Management are engaging with this training	□	□	□	□	□	□
	The training made me reflect on my role in ensuring the safety of the operation	□	□	□	□	□	□
	The training reflects the operational realities of my job	□	□	□	□	□	□
	I like that all employees do the same training	□	□	□	□	□	□
LEARNING	After having followed the training I feel more responsible for my part of the operation	□	□	□	□	□	□
	I have an increased awareness of my personal role in ensuring safety and resilience	□	□	□	□	□	□
	I have learned about the difficulties facing other people's roles as they manage safety, workload and efficiency	□	□	□	□	□	□
	I have improved my awareness of resilience through having gained a better understanding of how all workers and management contribute to resilience and safety	□	□	□	□	□	□
	I have learned practical strategies which I can use in my job to improve resilience when unexpected situations occur	□	□	□	□	□	□
	I have learned how I could react to and anticipate unexpected problems or circumstances during work	□	□	□	□	□	□
	I am more aware of how my work impacts other parts of the operation	□	□	□	□	□	□
	After having followed the training I have learned more about the operation that the training targets	□	□	□	□	□	□
	After having followed the training I am more aware of how my work impacts other parts of the operation	□	□	□	□	□	□

	After having followed the training I have learned more about how different functions and roles in the organisation work together to ensure safety and resilience	□	□	□	□	□	□
	I feel more responsible for my part of the operation	□	□	□	□	□	□
	I have learned to reflect and evaluate how positive and negative experiences with resilience in practice contribute to improving the operation	□	□	□	□	□	□
	I have learned to reassess the mandated decision making space with the space of manoeuvre I need during unexpected situations or circumstances during work	□	□	□	□	□	□

PART 2 TORC Questionnaire (behavior and results) - Implement 3 to 6 months after training

General information
• Time to complete: approximately 10 minutes
• Data remain anonymous

Instructions for completion
• Use a ballpoint pen
• In the box ☐ of your choice mark an X
• If you make a mistake:
'black-out' [■] the wrong box and put an X in the right box ☒
• Seal the completed questionnaire in the enclosed envelope and return it to the research team
• All completed questionnaires will be collected once the distribution is complete and will be analysed only
by the TORC research team who are bound by ethical guidelines for research with human participants

THEME	*Please provide on the following propositions to what extent you agree with the statement:*	Strongly Disagree	Disagree	Agree nor disagree	Agree	Strongly agree	Do not know
BEHAVIOUR	In my everyday work, I use what I have learned in the training	□	□	□	□	□	□
	I have encouraged my colleagues to follow the training	□	□	□	□	□	□
	I have changed my behaviour since I have applied the training principles	□	□	□	□	□	□

	There is improved application of resilience strategies in practice by team members	□	□	□	□	□	□
	There is active participation of team members during training	□	□	□	□	□	□
	Team members are monitoring each other's resilience behaviour in practice	□	□	□	□	□	□
	Team members notify each other when a situation changes unexpected	□	□	□	□	□	□
	Safety performance is improving due to training in applying resilience resources and strategies	□	□	□	□	□	□
	I feel supported by my colleagues as I adopt the acquired competences	□	□	□	□	□	□
	I feel supported by my superiors as I adopt the acquired competences	□	□	□	□	□	□
	I feel able to translate what I learned in training to the workplace	□	□	□	□	□	□
RESULTS	From the perspective of my role the training is implemented correctly	□	□	□	□	□	□
	From the perspective of my role I can see an improvement in efficiency related to this training	□	□	□	□	□	□
	From the perspective of my role I can see an improvement in resilience related to this training	□	□	□	□	□	□
	I have noticed that my colleagues put into practice the things they learned in the training	□	□	□	□	□	□
	I have noticed that the number of suggestions for improvement of operational resilience increased	□	□	□	□	□	□
	I have noticed that there are fewer delays attributed to a lack of operational resilience	□	□	□	□	□	□
	I have noticed that there is less rework attributed to a lack of operational resilience	□	□	□	□	□	□
	I have noticed that the level of safety increased	□	□	□	□	□	□
	I have noticed that there is an overall positive impact on (the level of) safety culture	□	□	□	□	□	□
	I have noticed that there is increased efficiency and productivity as a result of increased operational resilience	□	□	□	□	□	□

BEHAVIOUR	What changes in resilient behaviour (i.e. application of resilient strategies and resources in daily practice) have occurred since you followed the training?

3.2 TORC IMPACT ASSESSMENT OF ORGANISATIONAL DATA

This element will look at existing data collected in the company and help safety managers collate it. This task is intended to be carried out by a safety manager or operations/ HR manager and it will involve the interrogation of various data sources. Generic data are gathered in the first instance followed by data specific to the solutions. The following topics are investigated:

- The scope of the organisation
- Application of resilience strategies and resources
- Accident data
- Incident data (LTIs, MTCs)
- Near-miss data
- HSE measures
- KPIs (Absenteeism, Productivity)

Detail and gather data on the following topics, as far as possible. Some of these data may already be gathered by the organisation as part of other systems or processes, and this may be done formally or informally. Any information on these topics should be collected if it exists in the company records. Alternatively attempts can be made to gather information on those topics for which there are not currently any data.

Obtaining 'hard' data on changes in critical performance indicators on organisational level outcomes:

- Impact on safety (tracking data on incidents/accidents/errors/near misses)
- Impact on resilience (tracking data on application of resilience strategies and resources and impact on operational activities)
- Impact on insurance premiums (have insurance costs – damage to assets, sick leave, etc. - been lower as a result of the solution implementation?)
- Impact on operational costs – please cite the KPI used (has the company been more productive or efficient as a result of the intervention implementation?)
- Impact on compliance (tracking non conformities/ outstanding action points)

3.2.1 Scope of the Organisation

1. Estimate the number of employees and hours worked. Include contractors and third-party employees. If data unavailable leave blank.

Year *		Estimated average number of employees (over the year)**		Hours worked (if available)	
	Number of sites operated	Company employees	Contractor employees	Company employees	Contractor employees
2016 YTD					
2015					
2014					
2013					
2012					

3.2.2 Application of resilient strategies and resources

Please indicate details about application of resilience in practice:	Data per team
1. Number of strategies used by teams	Number, Standard Deviation (SD)
2. Variety of strategies used by teams	Number, Standard Deviation (SD)
3. Number of resources used by teams	Number, Standard Deviation (SD)
4. Variety of resources used by teams	Number, Standard Deviation (SD)
5. Fit between strategies used and actual operational situation	1 - 5 Poor fit - perfect fit
6. Fit between resources used and actual operational situation	1 - 5 Poor fit - perfect fit
7. Impact of strategies/resources used and actual operational outcomes; i.e. finished the job in time, with less costs and no incidents	1 - 5 Negative impact – Positive impact
8. Fit between formal procedure(s) and actual operational condition(s)	1 - 5 Poor fit - perfect fit
9. Number of formal procedures evaluated after operational activities	Absolute number
10. Number of formal procedures adapted after evaluation of operational activities to better fit actual operational situations	Absolute number

3.2.3 Lost Time Injury Frequency (LTIF)

2. Detail the frequency rate of accidents that led to lost time and estimate the reliability of the data:

Year	**LTIF**		**Reliable data?**
	Company employees	**Contractor employees**	i.e. Are all data available and are you confident they are complete?
2016 YTD			☐ Yes ☐ No
2015			☐ Yes ☐ No
2014			☐ Yes ☐ No
2013			☐ Yes ☐ No
2012			☐ Yes ☐ No

Does your organisation include contractors or other third parties in LTIF calculations?	
Yes, recorded separately	☐
Yes, in the same registry	☐
No, not included	☐
Not applicable	☐
Other: (please give details)	☐

3.2.4 Other incidents

3. Identify the company's definition of incidents that are recorded:

Which of the definitions below is used by your organisation for registering incidents? (Select multiple if applicable)	
First Aid (on-scene treatment)	☐
Medical Treatment	☐
Restricted Work Case (RWC)	☐
Other: (please give details)	☐

4. Detail the number of incidents from these categories and estimate the reliability of the data:

Year	First Aid		Medical treatment		Restricted Work Case (RWC)		Reliable data?
	Company employees	Contractor employees	Company employees	Contractor employees	Company employees	Contractor employees	i.e. Are all data available and are you confident they are complete?
2016 YTD							☐ Yes ☐ No
2015							☐ Yes ☐ No
2014							☐ Yes ☐ No
2013							☐ Yes ☐ No
2012							☐ Yes ☐ No

If there were any workplace fatalities please provide details of the year, number of fatalities and detail whether it related to own employees or contractors:

Year	Fatalities	
	Company employees	**Contractor employees**

Does your organisation include contractors or other third parties in incident registry figures?	
Yes, recorded separately	□
Yes, in the same registry	□
No, not included	□
Not applicable	□
Other: (please give details)	□

3.2.5 Absenteeism Parameters

5. Detail the absenteeism rates (as below) and estimate the completeness of the data:

Does your organisation keep a record of the percentage of absenteeism?	
Yes	□
No	□

How complete2 **are these records of absenteeism?** (Is all information provided? E.g. Start of illness? End of illness?)	
Complete	□
Incomplete	□
Uncertain / Do not know	□

Does your organisation keep a separate indicator for the percentage of short-term sick leave? (less than 8 days, maximum seven days)	
Yes, and according to this definition	□
Yes, but according to another definition	□
No	□

6. Detail the rate of sick leave and absenteeism and estimate the reliability of the data:

Year	**% Sick leave general**		**% Short-term absenteeism**		**Reliable data?**
	Company employees	**Contractor employees**	**Company employees**	**Contractor employees**	i.e. Are all data available and are you confident they are complete?
2016 YTD					☐ Yes ☐ No
2015					☐ Yes ☐ No
2014					☐ Yes ☐ No
2013					☐ Yes ☐ No
2012					☐ Yes ☐ No

3.2.6 Health and Safety Measures

7. Provide information on health and safety measures:

Does your organisation identify, track and record health and safety related measures?	□ Yes	*Proceed to next question*
	□ No	*Skip to section 8*

Do these measures provide a timetable or deadline?	□ Yes	*Proceed to next question*
	□ No	*Skip to section 8*

How many occupational health and safety-related measures were planned and included a deadline in the past 12 months?	*Within the past 12 months what percentage of the planned measures relating to health and safety were conducted within the foreseen deadline?*
☐ None ☐ 1 to 5 ☐ 6 to 25 ☐ 26 to 50 ☐ 51 to 200 ☐ 201 or more ☐ Unknown / not measured	Measured percentage:___ (if available) Estimated percentage: ☐ 0% to 25% ☐ 26% to 50% ☐ 51% to 75% ☐ 76% to 100% ☐ Not available
Additional comments:	Additional comments:

Does your organisation have a system for health and safety-related near miss reports in which reports are recorded?	□ Yes	*Proceed to next question*
	□ No	*Skip to section 9*

3.2.7 Near miss reports

8. Provide information on Near Miss reports (reported from within the organisation):

How many near miss reports did your organisation receive in the last 12 months?	*What percentage of these near miss reports were actioned within the company's own set of targets for response?*
☐ None ☐ 1 to 5 ☐ 6 to 25 ☐ 26 to 50 ☐ 51 to 200 ☐ 201 or more ☐ Unknown / not measured	☐ 0% to 25% ☐ 26% to 50% ☐ 51% to 75% ☐ 76% to 100% ☐ Not available Is this percentage estimated or recorded? ☐ Estimated ☐ Recorded
Additional comments:	*Please state target used in company:*

3.2.8 Productivity Parameters

9. Detail the productivity rates (as below) and estimate the completeness of the data:

Does your organisation keep a record of the level of productivity and efficiency of operations (profitability)?	
Yes	□
No	□

How complete are these records of productivity? (Is all information provided?	
Complete	□
Incomplete	□
Uncertain / Do not know	□

Does your organisation keep a separate indicator for the percentage of efficiency of the operations? (efficiency is expressed in profitability)	
Yes, and according to this definition	□
Yes, but according to another definition	□
No	□

3.3 TORC SELF-ASSESSMENT

TORC self-assessment enables a systematic evaluation of resilient behaviours in everyday practice. It builds on the same intervention elements and the proposed scale of resilient functioning (i.e. depend, build, stretch, etc.). TORC self-assessment can thus serves as an evaluation of a task being performed in practice, in a manner that links TORC training to everyday work beyond the designated training situation per se.

The evaluation self-assessment form can be found in Table 1. A key point is that the 'observations' provide behavioural evidence of the quality of implementation and adoption of TORC training. The duration of the evaluation depends on the scope of the implementation and the goals of the organisation but endeavours should be made to be as comprehensive as possible. In practice, the evaluation is supported by moderation of a shift supervisor or manager.

1. Resilient behaviour in practice	
Assessment Category	*Questions*
Situational Awareness (a seemingly stable situation can suddenly change all of a sudden)	What sudden change did you notice that incited your conception of a need for resilient response?
	What did you see or think was going on?
	Did you promptly identify/ detect that there was something wrong justifying resilient action?
Assessing (making sense of) the situation (the changes may result in an unsafe situation, you go from a starting situation to a situation other than foreseen)	How have you assessed the potential impact of the changed situation? (are they related to increase of existing risks, or additional risks introduced ?)
	What were the potential implications for yourself, the team and beyond?
	Were you able to immediately identify resources and/or strategies that you would need?
Anticipate	Did you identify different options for

(to the (assessed) changing situation)	further action?
	Were you able to identify possible future developments and needs?
	Which approach(es) did you have at your disposal? Where they sufficient? Did they resemble any "trained" ones?
	What skills did you have at your disposal? Where they sufficient? Did they resemble any "trained" ones?
Decision	Where you able to make a clear decision/choice?
	Did you need to extend your adaptive repertoire?
Monitoring the effect of the decision	Where you able to identify some crucial issues to monitor as a consequence of your decision?
	What was the impact of your decision made on your workload?
	What was the impact of your decisions taken on safety?
	What was the impact of your decision taken at the planned production?
	Did you oversee the influence of your decision?
	What did your decision mean for the next steps you took?
2. Manner of coping with disruptions	To be filled out cumulatively if applicable
Routine/Defend	Were the procedures sufficient to complete work according to plan?
	Were your past adaptive/resilient experiences sufficient to complete the work despite the disruption
Build/Extend	To what extent was it necessary to extend your procedures?
	To what extent were you able to prepare that extension in terms of planning?
	To what extent were you up against the limits of the existing procedures?
Stretch	To what extent were you departing from the procedures? How did you escalate the situation?
	Where you able to identify and understand the insufficiency of standard practices and procedures in terms of

	presumed scope, rationale and range of action (to cope with the situation)?

Table 1. TORC self-assessment evaluation form

3. Resilient behaviour in practice	
Assessment Category	*Questions*
Situational Awareness (a seemingly stable situation can suddenly change all of a sudden)	What sudden change did you notice that incited your conception of a need for resilient response?
	What did you see or think was going on?
	Did you promptly identify/ detect that there was something wrong justifying resilient action?
Assessing (making sense of) the situation (the changes may result in an unsafe situation, you go from a starting situation to a situation other than foreseen)	How have you assessed the potential impact of the changed situation? (are they related to increase of existing risks, or additional risks introduced ?)
	What were the potential implications for yourself, the team and beyond?
	Were you able to immediately identify resources and/or strategies that you would need?
Anticipate (to the (assessed) changing situation)	Did you identify different options for further action?
	Were you able to identify possible future developments and needs?
	Which approach(es) did you have at your disposal? Where they sufficient? Did they resemble any "trained" ones?
	What skills did you have at your disposal? Where they sufficient? Did they resemble any "trained" ones?
Decision	Where you able to make a clear decision/choice?
	Did you need to extend your adaptive repertoire?
Monitoring the effect of the decision	Where you able to identify some crucial issues to monitor as a consequence of your decision?
	What was the impact of your decision made on your workload?
	What was the impact of your decisions taken on safety?

	What was the impact of your decision taken at the planned production?
	Did you oversee the influence of your decision?
	What did your decision mean for the next steps you took?
4. Manner of coping with disruptions	To be filled out cumulatively if applicable
Routine/Defend	Were the procedures sufficient to complete work according to plan?
	Were your past adaptive/resilient experiences sufficient to complete the work despite the disruption
Build/Extend	To what extent was it necessary to extend your procedures?
	To what extent were you able to prepare that extension in terms of planning?
	To what extent were you up against the limits of the existing procedures?
Stretch	To what extent were you departing from the procedures? How did you escalate the situation?
	Where you able to identify and understand the insufficiency of standard practices and procedures in terms of presumed scope, rationale and range of action (to cope with the situation)?

A Dutch version of the evaluation form can be found in Appendix B.

3.4 TORC Game Observation form

The TORC observation form is used during the TORC game by maximum of two players to observe how their colleagues are performing on the following aspects:

1. Situational awareness (what do we know about risk/hazard/event; routine or non-routine)
2. Sensemaking (which warnings/signals should we be alert to)
3. Anticipation (what can we expect; how do we identify risks)
4. Decide (what must we do, including improvisation)
5. Monitor (side) effects of response on performance over time (does the situation improve or degrade)
6. What dilemmas played a role and which were pronounced?
7. At which times were rules or procedures exceeded?
8. What does and don'ts you would like to pass on to the next shift?
9. What would be your advice to the team based on your own knowledge and experience?

10. Relative cost/ benefit of response (how do we manage trade-offs between workload vs. safety vs. efficiency; increase or decrease on these outcomes)
11. Side effects of response (how do we prevent degradation of critical functions?)

The TORC observation form can be found in Appendix C.

3.5 TORC ASSESSMENT IMPLEMENTATION ROADMAP FOR TORC USERS

In order for organisations to plan, implement and sustain the Impact Assessment process it is necessary to set out a roadmap – detailing who manages the process, how the process runs, who is involved and in what order the assessments take place. The process is set out in Figure 4 The TORC Impact Assessment process in the form of an infographic.

The process starts with observations done during the TORC training and evaluations taking place after the TORC training by means of the TORC logposter. Finally, the TORC questionnaire is used to evaluate the training immediately after the training and 3 months afterwards.

This whole process is managed by the safety manager/ trainer of the company in question. He/she is also responsible for distributing the questionnaire(s) and ensure that all staff can complete the questionnaire confidentially. Ideally this will cover all levels of the organisation – not just those that are immediately impacted by the training. This is to target any unintended consequences or oversights for other roles not directly impacted. Then the safety manager should begin the process of the observations, targeting the application of resilient behaviours in practice; i.e. using the new resilience strategies and resources (as targeted in the TORC training), and looking at documents or evidence of past behaviour (such as processes and systems being put in place and managed effectively, and/or facilitating the use if the self-assessment scheme).

The TORC self-assessment form is used to evaluate everyday work activities on resilience aspects as described in section 3.3 Once this is complete the focus shifts to the analysis of organisational data. This is again managed by the safety manager or equivalent person and it relates to the interrogation of existing company data and the supplementation of this with additional analyses targeting outputs measures like safety, productivity and (operational) costs.

Figure 4 The TORC Impact Assessment process

4 Conclusions

In this report we have developed an Impact Assessment Framework to assess the impact of the TORC training implementation. Measures to interrogate the impact of training were defined, and a plan for their final validation beyond the Dutch (TNO) piloting has been described (see below). Finally, a methodology for the integrated use of these measures was defined (TORC Impact Assessment implementation roadmap). This document describes the means of identifying the impact of the implementation of resilience resources and strategies in companies and thereby ensures the long-term application of the TORC training intervention.

This report describe the approach taken to the specification of the metrics and the methodology followed to refine and validate them with research partners of the consortium and industrial stakeholders in a workshop. This task can support the transfer process by evaluating the effectiveness of the TORC training implementation and overall transfer through some new, and some established impact metrics. The objective was about developing the metrics to assess the impact of applying resilience resources and strategies: what and how to measure the performance outcome for a socio-technical system as a result of a resilience intervention? Both during and after training (over time). The metrics specified and outlined in Section 3.2 provide organisations with the tools to measure and assess the impact of their own resilience investments, and measure the outcomes of this process.

The assessment methods will be partly tested in WP2, WP3 and WP4 after the final implementation of TORC training, and required fine tuning will be performed. Given that actual behaviour change will only occur over time (expected at least 3 months after the TORC training) - as is the case with changes in organisational outcomes (i.e. Level 4: Results) – these outcomes can only be established after the TORC project has been ended. The evaluation forms developed for this purpose within this deliverable can be used by the companies themselves by then.

Although we did not have the opportunity yet to experience all evaluation methods in practice, we received some positive first impressions that are worth to be mentioned already. Industrial partners responded positively to the TORC training, both management and field staff. They believe they increased their resilience competence and valued the TORC training both approach and content. One Dutch industrial partner started after the training was given, to more than 700 employees, to investigate if staff used the learned new competences into practice. They asked their teams after each night shift to respond in a systematic way on resilience behaviours and resources they did or did not experienced, in line with the self-assessment form as described in section 3.3 of this report. Furthermore, they evaluated the TORC sessions after every participant had followed the TORC training.
Another (Dutch) industrial partner is willing to use the game board in their day-to-day operation beyond the particular training situation in order to let their operational teams rethink the newly learned steps during work when they feel they need it, for example when something occurs that was not planned or expected in work preparation. They will try to investigate the results it brings to them later. The questionnaire is planned to be send to the participants a few weeks after the TORC project is ended. Another (Dutch) industrial partner is willing to implement the

TORC training and let all operational staff members follow the TORC training this summer. Afterwards they will evaluate the impact of the training with their staff using the developed methods.

The methodology and metrics for managing the TORC impact assessment process ensures that company managers can evaluate fully the impact on their operation as a result of the implementation of the TORC training (on resilience, relationship with overall safety / efficiency and workload and on the overall operation). The inclusion of generic metrics ensures that the TORC training transfer methodology is fully sustainable in that it can be carried out in the future for other resilience interventions and the impact of their future implementation can also be assessed – thereby ensuring the legacy of the TORC project.

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Appendix A: Dutch versions TORC questionnaire

PART 1 TORC Vragenlijst (reactie & leren) - Direct na de training training

Algemene informatie
• Invultijd : Ongeveer 10 minuten
• De gegevens blijven anoniem

Aanwijzingen voor het invullen
• Gebruik een balpen
• Het vak ☐ van uw keuze markeren met een X
• Als u een fout maakt:
markeer het verkeerde vak zwart [■], zet met X in het juiste vakje
• Sluit de ingevulde vragenlijst in de bijgevoegde envelop en stuur het terug naar het onderzoeksteam
• Alle ingevulde vragenlijsten worden verzameld zodra de distributie is voltooid en zullen alleen worden geanalyseerd door de TORC onderzoeksgroep die aan ethische richtlijnen voor onderzoek met menselijke deelnemers is gebonden

THEMA	*Gelieve op de volgende stellingen aangeven in hoeverre u het eens bent met de stelling:*	Helemaal oneens	Oneens	Neturaal	Eens	Helemaal eens	Weet niet
REACTIE	Deze training biedt meerwaarde voor mijn werk	□	□	□	□	□	□
	Deze training draagt bij dat de gehele organisatie beter werkt	□	□	□	□	□	□
	De inhoud van de training is eenvoudig te integreren in mijn dagelijkse werk	□	□	□	□	□	□
	De aanpak en vorm van de training (game) vond ik prettig	□	□	□	□	□	□
	De training conflicteert met bestaande procedures en processen	□	□	□	□	□	□
	Mijn functie uitvoering zal door wat ik heb geleerd toe te passen verbeteren	□	□	□	□	□	□
	Management is actief betrokken bij deze training	□	□	□	□	□	□
	De training heeft ervoor gezorgd dat ik reflecteer op mijn rol om veiligheid te garanderen in het werk	□	□	□	□	□	□
	De training sluit aan bij de operationele realiteit van mijn werk	□	□	□	□	□	□

	Ik zou het prettig vinden als alle medewerkers deze training volgen	□	□	□	□	□	□
LEAREN	Na de training te hebben gevolgd voel ik mij meer verantwoordelijk voor mijn deel van de operatie	□	□	□	□	□	□
	Ik ben mij meer bewust van mijn persoonlijke rol bij het waarborgen van de veiligheid en veerkracht	□	□	□	□	□	□
	Ik heb geleerd over de moeilijkheden die anderen hebben bij het managen van veiligheid, werkbelasting en efficiency	□	□	□	□	□	□
	Ik heb mijn kennis verbeterd hoe fieldstaff en management kan bijdragen om veerkracht en veiligheid te verbeteren	□	□	□	□	□	□
	Ik heb praktische strategieën geleerd die ik kan gebruiken om veerkrachtig te zijn in onverwachte situaties.	□	□	□	□	□	□
	Ik heb geleerd hoe ik kan anticiperen bij onverwachte problemen en omstandigheden tijdens het werk	□	□	□	□	□	□
	Ik ben meer bewust geworden hoe mijn werkzaamheden andere werkzaamheden beïnvloedt	□	□	□	□	□	□
	Ik voel mij meer verantwoordelijk voor mijn taak in de werkuitvoering	□	□	□	□	□	□
	Door de training heb ik meer geleerd over mijn werk	□	□	□	□	□	□
	Door de training ben ik meer bewust over hoe mijn werkzaamheden andere werkzaamheden beïnvloedt	□	□	□	□	□	□
	Door de training begrijp ik beter welke verschillende taken en verantwoordelijkheden in de organisatie bijdragen aan de veiligheid en veerkracht	□	□	□	□	□	□
	Ik heb geleerd om te reflecteren en evalueren hoe positieve en negatieve ervaringen met veerkracht kan helpen om de taakuitvoering te verbeteren	□	□	□	□	□	□
	Ik heb geleerd om de beslissingsbevoegdheid/ mijn handelingsruimte te heroverwegen bij onverwachte situaties of omstandigheden tijdens het werk als dat nodig is	□	□	□	□	□	□

PART 2 TORC Questionnaire (gedrag & resultaten) – Implementeren 3 maanden na de training

Algemene informatie
• Invultijd : Ongeveer 10 minuten
• De gegevens blijven anoniem

Aanwijzingen voor het invullen
• Gebruik een balpen
• Het vak ☐ van uw keuze markeren met een X
• Als u een fout maakt:
markeer het verkeerde vak zwart [■], zet met X in het juiste vakje
• Sluit de ingevulde vragenlijst in de bijgevoegde envelop en stuur het terug naar het onderzoeksteam
• Alle ingevulde vragenlijsten worden verzameld zodra de distributie is voltooid en zullen alleen worden geanalyseerd door de TORC onderzoeksgroep die aan ethische richtlijnen voor onderzoek met menselijke deelnemers is gebonden

THEMA	*Gelieve op de volgende stellingen aangeven in hoeverre u het eens bent met de stelling:*	Helemaal oneens	Oneens	Neturaal	Eens	Helemaal eens	Weet niet
GEDRAG	In mijn dagelijkse werk, gebruik ik wat ik heb geleerd in de training	☐	☐	☐	☐	☐	☐
	Ik heb mijn collega's aangemoedigd om de training te volgen	☐	☐	☐	☐	☐	☐
	Ik heb mijn gedrag veranderd sinds ik de trainingsprincipes heb toegepast	☐	☐	☐	☐	☐	☐
	Er is een betere toepassing van de veerkracht strategieën in de praktijk door de teamleden	☐	☐	☐	☐	☐	☐
	Er is een actieve deelname van de teamleden tijdens de training	☐	☐	☐	☐	☐	☐
	Teamleden houden elkaars veerkrachtig gedrag in de praktijk in de gaten	☐	☐	☐	☐	☐	☐
	Teamleden melden elkaar wanneer een situatie onverwachts verandert	☐	☐	☐	☐	☐	☐
	De veiligheidsprestaties verbeteren als gevolg van de training in het toepassen van veerkracht middelen en strategieën	☐	☐	☐	☐	☐	☐
	Ik voel mij ondersteund door mijn collega's als ik de nieuw verworven competenties toepas	☐	☐	☐	☐	☐	☐
	Ik voel mij ondersteund door mijn managers als ik de nieuw verworven competenties toepas	☐	☐	☐	☐	☐	☐

	Ik voel dat ik in staat ben om wat in de training heb geleerd te vertalen naar de werkplek	□	□	□	□	□	□
RESULTATEN	Vanuit het perspectief van mijn functie wordt de training correct uitgevoerd	□	□	□	□	□	□
	Vanuit het perspectief van mijn functie zie ik een verbetering van de efficiency in relatie tot deze training	□	□	□	□	□	□
	Vanuit het perspectief van mijn functie zie ik een verbetering van de veiligheid in relatie tot deze training	□	□	□	□	□	□
	Ik heb gemerkt dat mijn collega's de dingen die ze geleerd hebben in de training in praktijk brengen	□	□	□	□	□	□
	Ik heb gemerkt da er een toename is van het aantal voorstellen voor verbetering van de operationele veerkracht	□	□	□	□	□	□
	Ik heb gemerkt dat er minder vertragingen optreden die toe te schrijven zijn aan een gebrek aan operationele veerkracht	□	□	□	□	□	□
	Ik heb gemerkt dat er minder herstelwerk is als gevolg van een gebrek aan operationele veerkracht	□	□	□	□	□	□
	Ik heb gemerkt dat de veiligheid is toegenomen	□	□	□	□	□	□
	Er is een algemene positieve impact op (het niveau van) veiligheidscultuur	□	□	□	□	□	□
	Er is een verhoogde efficiëntie en productiviteit als gevolg van de toegenomen operationele veerkracht	□	□	□	□	□	□

GEDRAG	Welke veranderingen in het gedrag hebben zich voorgedaan sinds je de training hebt gevolgd?

Appendix B: TORC Observation form (Dutch version)

1. Resilient gedrag in de praktijk	
Beoordelingscategorie	*Vragen*
Situationeel bewustzijn (een ogenschijnlijk stabiele situatie kan ineens zomaar veranderen)	Welke plotselinge verandering heb je gesignaleerd die de behoefte aan een veerkrachtige reactie vroeg?
	Wat zag of dacht je dat er aan de hand was?
	Is door jou tijdig gesignaleerd dat er iets niet klopte die een resilient respons rechtvaardigde?
Beoordelen van de situatie (de veranderingen kunnen een onveilige situatie opleveren; je gaat van een startsituatie naar een situatie, anders dan voorzien)	Hoe heb je de veranderde situatie beoordeeld in relatie tot de risico's ? (zijn de risico's toegenomen/ zijn er risico's bijgekomen?)
	Wat heeft de veranderde situatie voor jou, het team en het werk betekend?
	Was je in staat om onmiddellijk middelen en / of strategieën die je nodig zou hebben te identificeren?
Anticiperen **(**op de (beoordeelde) veranderde situatie)	Welke alternatieve opties had je tot je beschikking voor verdere actie?
	Was je in staat om mogelijk toekomstige ontwikkelingen en hulpbron(nen) te identificeren?
	Welke aanpakken had je tot je beschikking? Waren deze afdoende? Kwamen ze overeen met degene die je getraind had?
	Welke vaardigheden had je tot je beschikking? Waren deze afdoende? Kwamen ze overeen met degene die je getraind had?
Beslissen	Was je in staat een duidelijke keuze/ beslissing te nemen?
	Heb je je adaptieve repertoire vergroot?
Monitoren effect van de genomen beslissing	Was je in staat om een aantal cruciale problemen te identificeren om toezicht op te houden als gevolg van je beslissing?

	Wat was het effect van je genomen beslissing op jouw werkbelasting?
	Wat was het effect van je genomen beslissing op de veiligheid?
	Wat was het effect van je genomen beslissing op de geplande productie?
	Kon je de invloed van je beslissing overzien?
	Wat betekende je beslissing voor de vervolgstappen die je nam?
2. Het omgaan met verstoringen	In te vullen cumulatief indien van toepassing
Routine	Waren de procedures voldoende om je werk volgens plan af te ronden?
	Waren je veerkracht/ adaptieve ervaringen uit het verleden voldoende om het werk volgens plan af te ronden ondanks de verstoring?
Rekken	In hoeverre was het noodzakelijk om je procedures en werkwijzen geheel of gedeeltelijk op te rekken?
	In hoeverre was je in staat om het oprekken van de grenzen van je procedures voor te bereiden in termen van planning?
	In hoeverre zat je tegen de grenzen van bestaande procedures aan?
Strekken	In hoeverre was je aan het afwijken van de procedures? (Hoe heb je geëscaleerd?)
	Was je in staat om de ontoereikendheid van de standaard praktijken en procedures te herkennen en begrijpen in termen van de vermoedelijke scope, de motivering en het bebereik van de actie (om met de situatie om te kunnen gaan)?

Appendix C: TORC Game Observation form (English and Dutch version)

After Action Review Observers *Pay attention 2 pages*	Name observer: ..... Game round:	1/2

	tops	tips
Situational awareness *(Was the team alert to (early) warnings / signals that the situation could deteriorate at your fingertips)*		
Assessing (Did the team actively assessed the risks / hazards / events was it routine or non-routine for them, standard or complex)		
Anticipation (look ahead) (Did the team correctly assessed the risks that accompanied the situation)		
Decide *(Did the team responded well to the situation, was the decision unanimous for a particular response, have they made use of decision support or did they needed this from expert or management)*		

Monitoring effect of action	2/2
What dilemmas played a role and which were pronounced?	
At which times were regulations exceeded?	
What do's and don'ts would you like to pass on to the next shift?	
What would be your advice to the team based on your own knowledge and experience?	
Relative costs / benefits of the decision *(Did the team manage tradeoffs between the workload versus safety versus efficiency well given the particular unexpected events)*	
Overall effect of the decision on the action *(Is the overall safety, workload or efficiency improved or deteriorated as a result of the team's response)*	
Consequences of the decision *(Did the team prevent any degradation of critical functions over time)*	
Additional comments	

After Action Review Observator *Let op 2 pagina's*	Naam observant: ..... Spelronde:	1/2

	tops	tips
Situationeel bewustzijn ***(Was het team alert op (vroegtijdige) waarschuwingen / signalen dat de situatie binnen handbereik zou kunnen verslechteren)***		
Beoordelen ***(Heeft het team actief de risico's / gevaren / gebeurtenissen beoordeeld; was het routinematige of niet-routinematige voor hen; standaard of complex)***		
Anticiperen (vooruit kijken) ***(Heeft het team de risico's die gepaard gingen met de situatie juist beoordeeld)***		
Beslissen ***(Heeft het team goed gereageerd op de situatie, was de beslissing voor een bepaalde respons unaniem, hebben ze gebruik gemaakt van ze beslisondersteuning of hadden ze dit nodig van experts of het management)***		

Monitoren effecten actie	2/2
Welke dilemma's speelden en werden die uitgesproken?	
Op welke momenten werden regels overschreden?	
Welke does and don't zou je aan volgende ploeg willen doorgeven?	
Wat zou uw advies zijn aan het team op basis van uw eigen kennis en ervaring?	
Relatieve kosten / baten van de beslissing *(Heeft het team compromissen tussen de werkbelasting versus veiligheid versus efficiëntie goed gemanaged gelet op de bijzondere onverwachte gebeurtenissen).*	
Totale effect van de beslissing op de actie *(Is de algehele veiligheid, werkdruk of efficiency verbeterd of verslechterd als gevolg van de respons van het team).*	
Gevolgen van de beslissing *(Heeft het team actief eventueel degradatie van kritische functies over de tijd voorkomen).*	
Aanvullende opmerkingen	

6. Signature

Leiden, 26 July 2016 TNO

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Sustainable Urban Mobility & Safety

Dolf van der Beek
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