Resilience Management Concepts and Application Tutorials

VERSION
Version 1.0

DATE
30-Nov-17

ABSTRACT
The DARWIN project aims to develop state of the art resilience guidelines and innovative training modules for crisis management. The DARWIN Resilience Management Guidelines (DRMG), which will evolve to accommodate the changing nature of crises, are developed for those with responsibility of protecting the population or critical infrastructure and services from policy to practice.

The main purpose of this deliverable is to describe the DARWIN Training and Maintenance Package (TPM). This TMP is composed of the following main items:

1. DARWIN Wiki tutorial to access, the DRMG and associated resilience Concept Cards (CCs)
2. Power point slides that introduce the DRMG, the “DARWIN’s Guide to the DRMG and CCs”
3. A set-up for a DARWIN Training for Operational Resilience Capabilities (D-TORC)-game using a case study containing specific elements from CCs and the pilot evaluation, with special emphasis on how surprises challenge existing plans, procedures and presumptions
4. Academic course proposition on Resilience management based on the DRMG

To ensure cross-sector applicability, a new EU-Wide DARWIN Community of Crisis and Resilience Practitioners (DCoP) including stakeholders and end-users from various domains and critical infrastructures have been established. The TPM benefits from inputs given by members of DCoP. Readers such as CI managers, practitioners, front-line operators may use this document as training material and introduction to resilience management. It aims to enhance understanding on resilience management during crisis and everyday situations. Readers from the DARWIN project can use this document during evaluation or workshops associated to development of resilience management guidelines.

KEYWORDS: Resilience, Resilience Engineering, Crisis Management, Training, Serious Games, Innovation Games

DELIVERABLE ID
D3.4

SYGMA ID
D11

DISSEMINATION LEVEL
PU

DELIVERABLE TYPE
R/OTHER
# D3.4 Resilience Management Concepts and Application Tutorials

## Authorship and Approval Information

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<td>PCOS proposed</td>
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<td>0.5</td>
<td>06-Nov-2016</td>
<td>BGU contribution and SINTEF contributions</td>
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<td>0.8</td>
<td>23-Nov-2017</td>
<td>Intermediate proposed</td>
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<td>0.9</td>
<td>29-Nov-2017</td>
<td>External revised</td>
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<td>1.0</td>
<td>30-Nov-2017</td>
<td>Released</td>
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*The project uses a multi-stage internal review process, with defined milestones. Milestone names include terms (in bold) as follows:

- **PCOS proposed**: Describes planned content and structure of different sections. Document authors submit for internal review.
- **PCOS revised**: Document authors produce new version in response to internal review comments.
- **PCOS approved**: Internal project reviewers accept the document.

- **Intermediate proposed**: Document is approximately 50% complete – review checkpoint. Document authors submit for internal review.
- **Intermediate revised**: Document authors produce new version in response to internal reviewer comments.
- **Intermediate approved**: Internal project reviewers accept the document.

- **External proposed**: Document is approximately 100% complete – review checkpoint. Document authors submit for internal review.
- **External revised**: Document authors produce new version in response to internal reviewer comments.
- **External approved**: Internal project reviewers accept the document.

- **Released**: Executive Board accepts the document. Coordinator releases the deliverable to the Commission Services.
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The research leading to these results has received funding from Horizon 2020, the European Union’s Framework Programme for Research and Innovation (H2020/2014-2020) under grant agreement no 653289.
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<td>DRMG</td>
<td>DARWIN Resilience Management Guidelines</td>
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<td>DRS-7</td>
<td>Topic ID for the call behind this project. Full name of call is &quot;Disaster-resilience: safeguarding and securing society, including adapting to climate change&quot;. Full name of topic 7 is &quot;Crisis and disaster resilience – operationalizing resilience concepts&quot;.</td>
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<td>DCoP</td>
<td>DARWIN Community of Crisis and Resilience Practitioners</td>
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<td>D-TORC</td>
<td>DARWIN Training for Operational Resilience Capabilities</td>
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<td>TMP</td>
<td>Training and Maintenance Package</td>
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<td>TORC</td>
<td>Training for Operational Resilience Capabilities</td>
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Table 2: List of terms

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<tr>
<td>Approaches</td>
<td>A way of considering or dealing with a situation, challenge or problem.</td>
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<td>Concept</td>
<td>A set or conjunction of characteristic features/entities related to a common scope and rationale that is (at least partly) entangled with or concerns the scope of DARWIN, and with a presumed coherence related to an overall and wide understanding of &quot;resilience&quot;.</td>
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<tr>
<td>DARWIN DRMG</td>
<td>DARWIN Manifesto</td>
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<td></td>
<td>The DARWIN Resilience Management Guidelines (DRMGs) consist of guiding principles to help or advice a certain organisation in the creation, assessment or improvement of its own guidelines. Such principles should help the organisation in developing a critical view on its own crisis management activities (management of resources, procedures, training, etc.) based on resilience management concepts. It is important to underline that the DRMGs could become complementary to guidelines, procedures and practices already present in a certain organisation, but they are not intended to replace them. Consistently with this nature, the DRMGs are mainly addressed to policy makers, decision makers and managers at different levels in an organisation. They can only indirectly affect the activities of front line operators or first responders in crisis management, since these actors are users of those guidelines, procedures, practices that may have been redesigned or generated ex novo, after the adoption of the DRMGs by their organisation.</td>
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<td>Minimum Viable Solution</td>
<td>Also known as minimum viable product (MVP) is the set of minimum set of features required to test or experiment a solution. Its purpose is to get through the “build-measure-learn feedback cycle as quickly and efficiently as possible. The DARWIN project proposed this solution based on interactions with experts (managers and front line operations). This approach contrast the traditional product development of</td>
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<th>Term</th>
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| Resilience            | The term resilience is increasingly popular and has many definitions and understandings. The DARWIN project builds on systematic literature review on journals addressing resilience for crisis management, consortium knowledge and experience in the areas of Resilience Engineering and Community Resilience. DARWIN relates to proven resilience abilities:  
  • Anticipate threats, opportunities and cascade effects. It is not only about identifying single events, but how parts may interact and affect each other.  
  • Monitor in a flexible way means that the system’s own performance and external conditions focus on what it is essential to the operation  
  • Respond and adapt to expected and unexpected crisis in a robust and flexible manner. The system is designed to provide a limited range of responses, there is still a necessity to adjust responses in a flexible way.  
  • Learn and evolve from experience of actual events, successes and failures what to learn and how the learning is reflected in the organization. |
| Needs                 | Represent something that is essential for someone to be able to achieve a certain goal or task. The ultimate goal of resilience could be thought of as ensuring performance, safety and security. |
| Practices             | Represent a solution that has been incorporated/implemented in a real environment.                                                                                                                                               |
| Resilience Management | Resilience management addresses the enhancement of the abilities of an organisation to sustain adaptability and continue operations as required when facing expected and unexpected events. It includes “everyday operation” as this information is essential to ensure that the organisation functions. This information includes how multiple activities work together to produce successful outcomes for different kinds of systems and organisations at different levels. |
Executive Summary

This deliverable describes the training material which has been developed in the frame of DARWIN Work Package 3 (WP3 - Enabling tools for resilience management guidelines). Based on requirements elaborated in the initial part of the project as well as input from the DARWIN Community of Resilience and Crisis Practitioners, the Training Material Package (TMP) consists of two tutorials. The first tutorial explains how to use the Wiki dedicated to the DARWIN Resilience Management Guidelines (DRMG). The second tutorial gives an introduction to essential resilience concepts, interventions and methods. These two tutorials facilitate an easy access to the DARWIN Resilience Management Guidelines as well as Concept Cards. Hence, these two tutorials are contributing to the high-level DARWIN project objective O2 “To enable use of resilience guidelines in non-crisis situations, for purposes of: 1. Basic learning and familiarisation; 2. Practical training, based on simulation techniques (including “serious gaming”).”.

In addition to these two tutorials, the deliverable describes three different training approaches which are contributing to the above mentioned objective as well and in addition to the objective O7 “To establish activities that will lead to project results being adapted to, and later adopted by, practitioners in domains other than the two used in the pilots.” These approaches are academic courses as well as Industry and Master Courses and the so-called D-TORC (DARWIN Training for Operational Resilience Capabilities) concept. The D-TORC proposes new developments for training for managers as well as for front-line operation. An initial experiment on TORC was performed with the DARWIN Community of Resilience and Crisis Practitioners, this experiment indicated needs for further development. The version of D-TORC in this document addresses input from the DCoP such as focusing on specific parts of the scenarios. It also proposes potential ways to address the D-TORC training, based on an elaboration of the original TORC concept. There is a need of further experiments on D-TORC to determine its added value to enhancing understanding of resilience management in context, as defined in the DRMG.

In this document, we include a comparison of the different training approaches in terms of target users, intention, resources required, strengths and limitations. End users can use this comparison to determine which approach they would like to implement when addressing training associated to resilience management.

Other training approach not developed within the DARWIN project but used during pilot exercises is the Emergo Training System. This approach is used in many countries for crisis management and emergency preparedness. The use of the ETS training associated to concept cards will be described within the pilot evaluation of the DRMG. The interest on using ETS lays on linking CCs to existing training arenas and potential wide exploitation of the DRMG.

The deliverable D3.4 “Resilience Management Concepts and Application Tutorials” are therefore covering the results announced in the DARWIN overall result R8 “Training modules on resilience guidelines. Training modules on crisis resilience management adapted to different end users (e.g. air navigation service providers, hospital staff, airports first responders, practices and guidelines) to be used by DARWIN users”.

The DARWIN WP3 products as described within this deliverable are available for future usage within and outside the project consortium and will therefore help to facilitate the usage of the DARWIN Resilience Management Guidelines.

The usage of the tutorials for different purposes such as webinars and workshops will provide opportunities to improve its content. The tutorials presented in this document cover current version of the DRMG and associated concept cards. Thus, future update on training package needs to consider additional concept cards planned to be included in future DRMG developments.

This deliverable and associated presentations can be adapted by end-users while preparing training related to resilience management.
D3.4 Resilience Management Concepts and Application Tutorials

About the project: The DARWIN project aims to develop state of the art resilience guidelines and innovative training modules for crisis management. The guidelines, which will evolve to accommodate the changing nature of crises, are developed for those with the responsibility of protecting population or critical services from policy to practice.

The guidelines address the following resilience capabilities and key areas:

- Capability to anticipate
  - Mapping possible interdependencies
  - Build skills to notice patterns using visualisations
- Capability to monitor
  - Identify resilience related indicators, addressing potential for cascade
  - Establish indicators that are used and continuously updated
- Capability to respond and adapt (readiness to respond to the expected and the unexpected)
  - Conduct a set of pilot studies
  - Investigate successful strategies for resilient responses
- Capability to learn and evolve
  - Explore how multiple actors and stakeholders operate in rapidly changing environments
  - Enable cross-domain learning on complex events
- Key areas: social media and crisis communication; living and user-centred guidelines; continuous evaluation and serious gaming
1 Introduction

1.1 Purpose of the document

The aim of this document is to present different approaches of tutorials for resilience management and associated essential concepts described in the DARWIN Resilience Management Guidelines (DRMG). These tutorials constitute a bridge between the world of theories underlying the DARWIN project and the conceptualization of resilience perceptions for a wide range of content experts. Thus, will help to embed the DARWIN resilience concepts in the operational environments. The training material was used as preparation material for members of the DARWIN Community of Practitioners (DCoP) involved in the project, the pilots in WP4, and directed to external users as students for Masters’ Programs in Europe and Israel. In addition, the outputs of this deliverable may assist experts all over the world to understand the process of resilient management in a holistic view, and to implement them, to practical tools for teaching the resilient management of emergency preparedness and response. In this context, the outcome of Task 3.3 is the Training and Maintenance Package (TMP) which is associated with requirement of DARWIN deliverable D1.3. DARWIN Requirement DR-15 requires the DRMG to “contain a training and maintenance package that facilitates the introduction of the DRMG”. This TMP is composed of the following items:

1. Tutorial on DRMG Wiki and power point slides that introduce the DRMG. These slides are composed of the “DARWIN’s Guide to the DRMG” and concept cards

2. Resilience management academic course for professionals with interest on crisis management and resilience

3. A set-up and preparation for a TORC-game using a case study containing elements from the pilot cases that shows the effect of one or more specific concept cards, with special emphasis on how surprises challenge existing plans, procedures and presumptions.

The TMP will be available after the project and in addition it will support the exploitation of the DRMG.

1.2 Authorship and licenses

This document has been prepared with the following contributions:

- Overall document PCOS and contributions leaded by TUBS and BGU.
- Review of current training in crisis management and the academic course provided by BGU.
- Wiki tutorial, D-TORC and university descriptions provided by SINTEF
- All partners contributed to discussion and conclusions.

The DARWIN Wiki creative commons license. Thus, people using the guidelines can: Share — copy and redistribute the material in any medium or format. Adapt — remix, transform, and build upon the material for any purpose, even commercially. The attribution is that people using the guidelines must give credit to the DARWIN project and EC support. No warrants are given.

The D-TORC is adaptation of initial TORC concept developed within another EC project. Permission to use the concept can be given by SINTEF on request.

1.3 Intended readership

This deliverable describes tutorials that integrate various components of the DARWIN project: the knowledge that was established in primary stages of the project; the pilot scenarios that were developed subsequently; the CCs and the concept map of the DRMG. As such, this document is designed to provide
D3.4 Resilience Management Concepts and Application Tutorials

subsequently; the CCs and the concept map of the DRMG. As such, this document is designed to provide information for a broad scale of both experts as well as practitioners dealing with resilient management. Dividing the readership into external and internal users, internal readers of the project are members that will benefit from these tutorials in implementing the CCs (e.g. the WP4 pilot exercises). Partners who were involved in WP5 used the tutorials in meetings with the DCoP for explaining the CCs approach, and partners of WP6 will use it for spreading and assimilating the information and knowledge that were obtained by the DARWIN project. The tutorials are especially directed to external users as content experts, or to-be experts, in the field of emergency management. This deliverable is important for them, since it provides free reliable applications of resilient management that were developed and validated by leading international experts in this area.

1.4 Structure of this document

Below we give a short overview of how the document is structured:

- **Chapter 2** provides an overview on available training in crisis management to align the DARWIN tutorial to existing approaches
- **Chapter 3** describes relevant training for the DRMG Wiki and concept cards tutorials
- **Chapter 4** describes supporting training approaches to enhance understanding and uptake of resilience management guidelines.
- **Chapter 5** compares the different approaches used to provide indication on which approach is appropriate for specific context and stakeholders
- **Chapter 6** describes conclusions, lessons learned, limitation and strengths.

1.5 Stakeholder involvement – interaction with end-users

The involvement of end-users and stakeholders is central to achieving the development of the DARWIN Resilience Management Guidelines (DRMG), which is the main objective and core result of the DARWIN project. Their involvement will ensure transnational, cross-sector applicability and long-term relevance, and to secure their input and involvement in the project the DARWIN Community of Practitioners (DCoP) has been established. The DCoP includes relevant stakeholders and end-users representing different domains and critical infrastructures as well as resilience experts.

13th-14th April 2016 – DCoP workshop (WS1)

**Participants:** DCoP members involved in disaster management, policy makers, service providers, managers and first responders. Participants’ attendance at the workshop was from a variety of different disciplines and countries, and from a diversity of levels and responsibilities, e.g. from U.K, Israel, The Netherlands, Italy, Sweden, Germany, Norway and Spain. The participants were from a broad spectrum of organisations and specialities such as; director of the public emergency medical service, teachers within the resilience field, emergency medical officers, police, fire protection engineers, crisis manager, chairman of national council for trauma and emergency medicine, personnel from the National board of health and welfare, air traffic controllers as well as researchers.

**Focus:** Gather information for tool kit and training

**Outcome:** The workshop was an opportunity to collect information on training. Table-top exercises or high level technical training are seen as successful. The DCoP see benefits on computerized and video games as
they can be short and relatively cheap. There is a need to test interactions and collaborations with others, both within and outside the organisations, as well which is why full scale exercises are essential.

**28th -29th March 2017 – DCoP workshop (WS2)**

**Participants:** DCoP members from ATM, HC and other domains such as Air Traffic Domain (Italy, Sweden and France), Spanish Medical Emergency Service, Ministry of Health, Irish Water, Swedish Red Cross, Urgent Medical Center-Prishtina, Swedish Civil Contingencies Agency, National Center for Epidemiology, Surveillance and Health Promotion, Civil protection Department of Autonomous province of Trento, IT developer (Norway), London Ambulance Service, Resilient Cities representative from Rockefeller Foundation.

**Focus:** Gather information on training needs (survey) and one experiment on TORC training. The workshop included presentation of a Master course, stakeholder analysis in terms of training need and an experiment addressing the application of the TORC (Training for Operational Resilience Capabilities).

**Outcome:** The preferred format for training was discussed. The TORC exercise needs to be focused on specific areas of the scenario.

**Other opportunities**

- In January 2016, there was an opportunity to perform a lecture on DARWIN resilience concepts for crisis management based on concepts identified in DARWIN D1.1 at Linköping University targeted to professionals and academia.
- During 2016 and 2017, DARWIN material for lectures has been used at the Norwegian University of Science of Technology.

**1.6 Relation to other projects and initiatives**

The training material benefits from previous TORC research project as indicated in Table 3. Other projects that focus on aspects of resilience management might hold an interest in the training presented in the document. Among others, this includes other DRS-7 projects: RESOLUTE\(^1\), SMR\(^2\), IMPROVER\(^3\), RESILIENS\(^4\). Swedish project, project coordinator participates to the DCoP - CCRAAFFFTING (Creating Collaborative Resilience Awareness, Analysis and Action for the Finance, Food and Fuel System in INteractive Games) and IN-PREP new H2020 project invited to the DCoP.

**Table 3: Relation to other projects**

<table>
<thead>
<tr>
<th>Related research activities</th>
<th>Link to DARWIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training for Operational Resilience Capabilities (TORC, ERA-NET Safera 2014-2016) SINTEF addresses management and operational staff</td>
<td>DARWIN will use training developed in TORC for situations that can evolve in different ways. The aims are to sensitize, improve and develop resilience capabilities within response teams and emergency organisations.</td>
</tr>
</tbody>
</table>

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2. [http://ciem.uia.no/project/smart-mature-resilience](http://ciem.uia.no/project/smart-mature-resilience)
3. [http://improverproject.eu/](http://improverproject.eu/)
4. [www.resiliens.eu](http://www.resiliens.eu)
1.7 Relationship with other deliverables

This work uses the requirements of D1.3 as the baseline. The DRMG of D2.1 as its main influencing document. Globally speaking, the overall outcome of T3.3 is the TMP that can be used as a result of the whole project.

The training material presented in this document receives inputs from the following deliverables:

- **D1.3 – Practitioner and academic requirements for resilience management guidelines**: This deliverable provides the various types of requirements for the development and the evaluation of the guidelines.
- **D2.1 – Generic Resilience Management Guidelines**: The DRMGs (DARWIN Resilience Management Guidelines) and concept map provided the basis for the content of this deliverable. D3.4 describes the tools and methods to train people using the DRMG.
- **D2.2 and D2.3 – Resilience Management Guidelines adapted to healthcare and air traffic management**: These deliverables provide concrete examples related to resilience and crisis management.
- **DARWIN Community of Crisis and Resilience Practitioners (DCoP) workshops** have been conducted twice during 2016-2017 and a third DCoP meeting is scheduled for March 2018. The DCoP expressed their opinions regarding the needs for various training materials for resilient management.

The training tools and the material presented in this document serve as input for the following deliverables:

- **Deliverables associated to DCoP activities** – DCoP interactions, tutorials and training material are available for webinars and DCoP workshop,
- **Dissemination and exploitation activities** – The outputs of this deliverable will be in the public domain, available to any interested party. The training materials may serve as tools for building, teaching and training in the field of resilient management.

1.8 Addressing D1.3 requirements

The full list of D1.3 requirements is available in Appendix A. The following table presents a summary of the requirements that have been identified as relevant for this deliverable, and how they are addressed.

**Table 4: Addressing D1.3 requirements**

<table>
<thead>
<tr>
<th>Req-ID</th>
<th>Requirement</th>
<th>WP3 applicable</th>
<th>Means of compliance / how requirement is addressed in this deliverable</th>
<th>Status*</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR-15</td>
<td>The DRMG should contain a training and maintenance package (TMP) that facilitates the introduction of the DRMG.</td>
<td>Yes/NO</td>
<td>This document is the deliverable of the TMP. It is complemented with D3.3 addressing simulation and minigames. This deliverable consists of introduction to the wiki, introduction slides for the concept cards, the D-TORC game and an academic course on resilience.</td>
<td>Achieved</td>
</tr>
<tr>
<td>DR-38</td>
<td>The DRMG should support the establishment of a common terminology concerning resilience management across stakeholders.</td>
<td>Yes</td>
<td>Terminology is addressed in the DRMG both in terms of alignment with standards as well as resilience terms. This taken into consideration in the resilience course and the key resilience terms will be reflected</td>
<td>Achieved</td>
</tr>
<tr>
<td>Req-ID</td>
<td>Requirement</td>
<td>WP3 applicable</td>
<td>Means of compliance / how requirement is addressed in this deliverable</td>
<td>Status*</td>
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<td>---------</td>
</tr>
<tr>
<td>DR-45</td>
<td>The DRMG should support the use of resilience management support systems as a part of everyday practices.</td>
<td>Y</td>
<td>The slides can be used as a quick reference guide. Participants of the training course will benefit during everyday practices. The D-TORC may be used to address everyday as well as exceptional situations</td>
<td>Achieved</td>
</tr>
<tr>
<td>DR-54</td>
<td>The DRMG should specify the need to conduct joint training exercises to ensure efficient collaboration.</td>
<td>Y</td>
<td>The TMP builds on scenarios produced in the DRMG illustrations in the ATM and Healthcare domain as well as DARWIN evaluation deliverables. The TPM reflects on training in leadership and network coordination. The training material includes relevant CCs e.g. addressing cross-organizational collaboration, establishing of networks.</td>
<td>Achieved</td>
</tr>
<tr>
<td>DR-55</td>
<td>The DRMG should specify the need to train for resilience management routinely.</td>
<td>Y</td>
<td>In the material, the aspect of continuous training for resilience management will be covered.</td>
<td>Achieved</td>
</tr>
<tr>
<td>DR-56</td>
<td>The DRMG should specify the need to define training and exercises in a manner that enables personnel to improvise during the handling of situations when required.</td>
<td>Y</td>
<td>Improvisation is invited as a legitimate resilient response to exceptional circumstances in D-TORC gaming. The D-TORC training introduces game changers that motivate improvisation to handle situations.</td>
<td>Achieved</td>
</tr>
<tr>
<td>DR-57</td>
<td>The DRMG should address different magnitudes of emergencies, disasters and crises in training programs.</td>
<td>Y</td>
<td>The TPM includes different types of events. D-TORC and the introduction slides cover various levels of emergencies.</td>
<td>Achieved</td>
</tr>
<tr>
<td>DR-58</td>
<td>The DRMG should support design of scenario-based exercises to prepare for worst-case scenarios.</td>
<td>Y</td>
<td>Scenarios can be addressed by means of a combination of simulation and D-TORC. In addition to focus on specific scenarios, we need to address the preparation to be surprised. We address this aspect by introducing game changers during the D-TORC game</td>
<td>Achieved</td>
</tr>
<tr>
<td>DR-59</td>
<td>The DRMG should support development of education programs that focus on resilience management.</td>
<td>Y</td>
<td>The DRMG has been used as input during the development of academic course included in this deliverable.</td>
<td>Achieved</td>
</tr>
<tr>
<td>DR-74</td>
<td>The DRMG should support building resilience by applying organizational learning techniques (e.g. logbooks, debriefings, after-action reviews).</td>
<td>Y</td>
<td>Logbooks, debriefings, after-action reviews are central ingredients of D-TORC. The DRMG includes after-action review as relevant method of specific CCs.</td>
<td>Achieved</td>
</tr>
</tbody>
</table>
### D3.4 Resilience Management Concepts and Application Tutorials

<table>
<thead>
<tr>
<th>Req-ID</th>
<th>Requirement</th>
<th>WP3 applicable</th>
<th>Means of compliance / how requirement is addressed in this deliverable</th>
<th>Status*</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR-104</td>
<td>The development of the DRMG should consider gender-based differences between people (as reflected in their social roles and interactions, in the distribution of power and the access to resources).</td>
<td>Y</td>
<td>Some of the examples used are more interesting for specific genders. D-TORC training can address this by means of deliberate composition of training groups, situations and structuring of options for resilient action</td>
<td>Achieved</td>
</tr>
<tr>
<td>DR-110</td>
<td>The development of the DRMG should consider the stakeholders' needs of training for crisis management.</td>
<td>Y</td>
<td>The stakeholder analysis and DCoP interaction map training needs and practices.</td>
<td>Achieved</td>
</tr>
</tbody>
</table>
2 Review of current training in crisis management

Reviewing international training on crisis management may amount to a lengthy document, as there are numerous training programs around the world under the interchangeable titles of crisis, emergency, resilience, DRR (disaster risk reduction). Obviously when taking that mission, one must set up a systematic trajectory to be able to create a basic and structured understanding of the domain.

The basic assumption for this short literature review, following searches in online academic as well as popular (Google and Google Scholar search) data bases, is that training may be found in a continuum of academic levels including non-academic lay mans' training, and in a host of formats and lengths, and delivering (teaching) institutions. The organizing method therefor is to introduce the trainings by level and sector of organizations; starting with international level organizations, through governmental, academic and private sector. Additionally, since there are many examples, this review introduces a limited number of examples for each sector.

The first level is the international level. The search started with the UN and its organizations. WHO- the world health organization conducts trainings worldwide, yet the courses focus on health issues such as Emergency Medical Teams, risk communications and Emergency Communications Networks. A leading UN agency in resilience and crises management is UNISDR- The Office for Disaster Risk Reduction, mandated by the UN General Assembly (UN General Assembly Resolution 56/195) to be the focal point "in the United Nations system for the coordination of disaster reduction and to ensure synergies among the disaster reduction activities of the United Nations system and regional organizations and activities in socio-economic and humanitarian fields”

UNISDR offers training in the fundamentals of the emergency planning process, including the rationale behind planning. The 5-day course offered to emergency management personnel is oriented towards the base knowledge of future DRR professionals, and it commits to theory and practice.

Topics outlined in the syllabus include:

- Disaster theory and practice
- Definitions and concepts
- Warning system components
- Risk assessment
- Hazard Identification Process
- Risk Analysis: Probabilities and Consequences
- Risk Management
- Hazard Forecast Based Risk Estimation Analysis
- Development of Decision Support Tools
- Risk Communication
- Risk Communication Process and Tools
- Contingency Plans
- Organizational Preparedness and Response Preparation
- Emergency and Disaster planning
- Integrated emergency management practice and issues
- Business continuity management
- The management of natural and environmental disasters
- GIS & RS, science and services
- Research design and methods;

There is no feedback or evaluation information on the program, yet it is popular within the 168 states signed on the Hyogo (2005) and Sendai (2015) treaties which are the foundation for UNISDR work.
D3.4 Resilience Management Concepts and Application Tutorials

Other international level organizations that were considered were: the EU, which offers substantial funding for research and promotes training through its initiatives; and the NATO that offers mainly military and medically focused training, like the NATO Emergency Medical Multinational Team Training (EMMT). EMMT training includes topics such as: Crew Resource Management (CRM), Cultural Differences, Communication Skills, Tactical Field Care, Hand-over/Take-over; Stress Management; Multinational Team Training.

On the governments' level, this review introduces two training programs chosen out of many others solely on the merit of publishing detailed training programs.

First example of a state training scheme is offered by a Swedish American collaboration supported as previously mentioned by EU and administered by the Swedish National Defence College. Designing Crisis Management Training and Exercises for Strategic Leaders (Eric Stern Ed.). This publication is a result of a unique partnership between academic, private sector, and governmental experts from the United States and Sweden. It was developed through a series of collaborative bilateral workshops held in Stockholm and Washington, D.C. during 2013 and 2014. The leading idea is that resilient societies demand resilient leadership —leadership that is prepared to act in an agile, decisive, forward looking and legitimate way even under the most extreme and difficult conditions. This assumption leads to the need for training for leaders: "Even the most experienced and qualified leaders need to cultivate crisis management skills and practice regularly in order to be prepared when crisis comes. Designing and conducting exercises for strategic leaders is a vital but demanding task and one where inspiration from abroad can be very helpful". The publication contains chapters on Working with Strategic Leaders: Challenges and Design Questions, Exercises for Strategic Leaders: Perspectives and Lessons Learned from the U.S. National Exercise Program (FEMA), Executive Education Seminar (Mobile Education Team Program) and Exploring Emerging Technologies for Training Strategic Leaders. Additional it refers to An In-Depth Case Study of an Emerging Training and Exercise Technology, and Case-based Scenario Development.

Boin et al. (2005) claiming that several decades of intensive empirical research shows that leaders face recurring tasks when confronted with crises: sense making, decision making, meaning making, terminating, and learning They suggest focusing crisis management trainings for leaders in capacity building for these tasks.

The second example of a government level program is the US FEMA training program. FEMA created the EMI Emergency Management Higher Education Program with the goal to encourage and support the dissemination of hazard, disaster, and emergency management-related information in colleges and universities across the U.S, so that more and more emergency managers in government as well as in business and industry will come to the job with college education that includes a degree in emergency management. FEMA delivers its trainings through colleges and universities across the US in all academic levels. The first two choices in FEMA's recommendation list are the PhD Programs in George Washington University – Ph.D. in Engineering Management with Research Focus in the Field of Crisis, Emergency and Risk Management and the Georgia State University - Ph.D. Degree in Public Policy with Disaster Management Specialization. Requirements for admission to GW are research interests in the field of crisis, emergency and risk management. Georgia State University offers a Ph.D. program in public policy and also has a joint Ph.D. program in policy with Georgia Tech. Students may choose disaster management as one of two areas of specialization in both programs. Students interested in disaster management usually choose environmental policy or public administration as a complementary specialization.

FEMA's choice to train through the academy leads naturally to the academic sector. One ranking system compares crisis / emergency / disaster management degrees in US colleges also marks Georgetown University of DC as the highest-ranking program. This is a program offered On-Campus, Online, and in an Executive Master's Formats according to the GU website.
Executive Master’s Degree—Hybrid Program in Emergency & Disaster Management immerses experienced practitioners in the high-intensity field of emergency management through a unique combination of online learning and on-site intensives. It is a one-year program of five modules that explores hazards and emerging challenges across diverse environments. The program integrates critical thinking exercises, hands-on practice, engagements with some of the world’s top industry experts and organizations. Online study, developing a deeper understanding of key concepts and industry best practices through individual coursework, virtual classroom discussions, and group projects. (Based on program brochure).

In a different Master’s degree designed for entry- and mid-level professionals, "the master’s in Emergency & Disaster Management prepares students with the critical skills and experience needed to take action before and after disaster strikes". Students learn how to successfully manage risks, vulnerabilities, and threats ranging from natural hazards, health pandemics, and industrial crises to acts of terrorism. The program emphasizes according to the catalogue "the contemporary skills that students need to become effective practitioners in this evolving field".)

It may be worth noting that the main disciplines in the two highest ranking programs are engineering and public policy as the main context of the training.

Another look at the academic work is through published papers in academic frameworks such as peer reviewed journals. The tendency in these papers us to promote use of advanced technology for training and there is less focus on content.

Bacon et al. (2012) advocate the development of a smart environment for crisis management training in place of the paper-based, collective group dynamic exercise. Rankin Field, Rooney, and Eriksson (2011) carried out a study under the CRISIS project, funded by the European Commission’s FP7 Framework Program for Security Research, promote A Virtual Reality Based Training System for Increasing Resilient Performance in Crisis Management Organizations to "increase resilience in Crisis Management (CM) teams. Today’s training systems largely focus on technical and procedural skills, enforcing limitations on the freedom of interaction the trainee has, compared with the real world". Thus, the main challenge is to best simulate the world, but there is no mention of the issues, and the context of resilience.

Another research; Educating Users for Disaster Management: An Exploratory Study on Using Immersive Training for Disaster Management introduced at 2013 IEEE International Conference in MOOC, Innovation and Technology in Education (MITE) declares that "educating users for effective disaster management skills can be a challenge that requires different levels of training support". While the training requirements can be different with respect to the contexts of managing different disaster types there can be generic training requirements that should be incorporated into all types of disaster management training.

Ben Gurion University of the Negev in Israel provides a master’s program for emergency preparedness and response in the department of Emergency Medicine and the department of health systems management.

Over the years, Israel has been challenged with many events that required the response to emergency situations and, therefore, called for ongoing preparedness. The experience and knowledge gained from this practice, further developed and empowered by academic learning, was gathered to form the postgraduate degree. This program takes an all-embracing, comprehensive approach in this area, where large organizations, employers, public facilities, and communities are prompted to employ emergency and disaster specialists. These specialists are encouraged to obtain the knowledge base necessary to tailor both preparedness and response solutions for specific environments and gear into action, at time of need.
The aim of the Master’s program is to increase knowledge and understanding of various aspects of emergency and disaster situations. The program contributes to developing a common language, leadership and managerial tools, for optimal functionality of the healthcare system and of organizations and communities in crisis situations. The current program is in Hebrew but an international one-year program is currently in the building. The program is designed for professionals that wish to expand their knowledge and abilities this growing field. It has no prerequisites except for basic knowledge of research methods. The program promotes research and higher learning and includes two tracks: a research track which leads to the writing of a thesis dissertation and a management and education track, which includes additional courses and a research project.

At the levels of NGO’s and business sectors there are numerous examples of courser and trainings offered locally and internationally. These may range from a number of hours to a number of days long training, and are usually promoting the training agency’s agenda. One example is the Israeli based Community Stress Prevention Centre that promotes the salutogenic approach to coping and resilience in local and international crises, and of preparedness, response and recovery as the full life cycle of a crisis.

This is one of the rare examples of training that focuses on management of the human factor in crises management.

3 Training on DARWIN resilience management guidelines

This chapter describes how the content of the DRMG can be presented to the end users, i.e. the persons who might implement the interventions proposed in the DARWIN guidelines. It begins with a tutorial on the DRMG Wiki and it also contain the description of the slides used to introduce the DRMG and their underlying concepts.

3.1 Tutorial on DRMG Wiki

In the course of the DARWIN project, a wiki platform has been used to develop and manage the guidelines. The content is the result of co-creation between DARWIN partners and DCoP members, as representative of guidelines’ end-users. The wiki is described especially in the DARWIN deliverables D3.1 and D3.2.

In order to facilitate the usage of the wiki and access to the guidelines’ content, a tutorial is given here. The DARWIN Wiki can be accessed at: http://sintef9013.com/darwin_wiki/. At the time of the writing of this report, the wiki is only accessible to project partners and members of the DARWIN Community of Practitioners (DCoP); it therefore requires a login and password. Anyone interested can contact the DARWIN project, become a member of the DCoP and receive credentials to access the DARWIN wiki. At the end of the project (scheduled for Fall 2018), the wiki will become a public resource.

3.1.1 Main access to the guidelines: left menu

Once login is successful, the main page can be accessed. Items in the left menu give access to the guidelines’ content:

- Links to different ways of accessing Concept Cards: a list of all CCs is available, or classified by resilience abilities or functions of crisis management (based on the functional model)
- DARWIN terminology
- A “user manual” that aims to help end-users to find information and navigate in the wiki has been created but is changing regularly due to modifications to the wiki. This section gives an overview of the content provided in this page.
D3.4 Resilience Management Concepts and Application Tutorials

Note that, in this document, we are only presenting the part of the wiki accessible to end-users. Other pages exist, which are used by developers of the guidelines and administrators of the wiki. Those pages are hidden to end-users.

In addition to Concept Cards, a number of pages have been created in order to provide or organise DRM content, such as: terminology; lists of categories (e.g., resilience abilities, functions of crisis management); reference pages for practices, methods and tools. End-users might navigate to these pages, but their creation and modification is the role of developers.

3.1.2 Guidelines content

If “view all” is selected, Figure 3-1 can be seen. This page lists all the Concept Cards currently available, organized by themes. Each CC is shortly described through its title and a short paragraph presenting its purpose. In addition, if the reader wants more details on a CC, the purpose description can be expanded: clicking on the section will reveal a table that gives an overview of the interventions proposed by the guideline, and their expected outcomes.

Figure 3-1: DARWIN Wiki Main Page

The research leading to these results has received funding from Horizon 2020, the European Union’s Framework Programme for Research and Innovation (H2020/2014-2020) under grant agreement n° 653289.
The first item “DRMG approach, principles and objectives” is connected by link to a separate page that provides an overview on the nature of resilience in crisis management, restates the Guidelines Manifesto of WP2 Figure 3-2 and describes how to use the guidelines.

For each concept card, a separate page is available, with contents that can be seen in Figure 3-3.
After an introduction of the concept, the implementations before, during and after a crisis are presented. In the category “Understanding the context” additional information is provided which includes the expected benefits and if possible an illustrative example.

This is followed by the relevant practices, methods and tools which are described shortly and the references with further reading.

3.1.3 Advantages, limitations and next steps

The wiki platform simplifies the inclusion of a tutorial directly with the guidelines. In addition, as a web resource, it allows for the use of rich multimedia content. Such content can be both more engaging and more effective at conveying or illustrating points from the tutorial.
D3.4 Resilience Management Concepts and Application Tutorials

The tutorial content currently available only provides explanations in textual format. It will be expanded to include richer content, such as pictures, screen captures and links. A short video tutorial (~5 min) is also under preparation, based on the “user manual”.

In terms of coverage, the tutorial only focuses for the moment on helping end-users to find information and navigate in the DARWIN wiki. Additional content will be provided before the end of the project:

For end-users, explanations will be provided in the near future on how to use discussion pages to provide feedback directly in the wiki. This feature is still under development (process, capability) as part of D2.4, in collaboration with WP4.

For developers, the development guide that was available as a Word document will be updated and will serve as a base for another tutorial directly on the wiki. Such tutorial will complement the more basic information provided directly in the concept card creation forms (in the form of concise help information for each field). The tutorial will include details about the development of both generic content (based on the guide available and process described in D2.1), and adapted content (adapted from the process described in D2.2 and D2.3). This tutorial will be developed in the context of D2.4.

3.2 Tutorial on concept cards

During the 2nd DCoP workshop in Linköping in March 2017, the demand for a less academic approach to the concept cards arose. Thus, it has been identified that the production of short presentations introducing specific concepts are necessary. These presentations have been developed by TUBS and focus on the triggering questions of the DRMG (DARWIN 2016a).

The title page is depicted in Figure 3-4.

![Figure 3-4: Title Page of the DARWIN’s Guide to the Concept Cards](image)

The presentation consists of a short overview of DARWIN and resilience and then describes the concepts. Part of the presentation is the description of the structure of concept cards shown in Figure 3-5.
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detailed ex

Figure 3-5: Structure of a concept card

For each of the concept cards, an overview slide has been produced and then the triggering questions have been illustrated using pictograms (e.g. Figure 3-6).

Figure 3-6: Illustration for the “Common Ground” concept card

In this figure, the member of one organisation passes the information about his or her organisation to members of other companies and institutes. The pictograms for persons are thought to be androgen and thus gender-neutral.

The complete set of slides (all in all 70 slides) can be used by any stakeholder to get an easy access to the DARWIN concept cards mainly as defined within Initial Generic Resilience Management Guidelines (D2.1). Given the nature of evolving guidelines, it is recommended to verify its detail content of the DRMG in the wiki to update content of the training material. For example, the current DRMG version include relevant material (illustrations, interventions, methods from specific CI such as healthcare and ATM). For a more detailed example we include an extract of the current version of the training material in Appendix A.
4 DARWIN supporting training approaches

4.1 D-TORC: DARWIN applied TORD

4.1.1 The need for training "at the limits"
It will be beneficial for DRMG uptake to be able to go deeper into specific situations in which trainees are given the opportunity to explore the limits of (resilient) operation. This includes the interactions and possible tensions due for instance to time and resource constraints, between actors at different authority levels. Hence there is a need for a training scheme that can operate at different organization levels, individually as well as in conjunction, addressing topics that are related to CCs in a manner that is pragmatically recognizable in the participants’ own operational context. The TORC approach offers such features, including the opportunity to create tailored training situations.

4.1.2 Development of Training for Operational Resilience Capabilities (TORC) for Resilience Management; from TORC to D-TORC

The SAFERA project TORC (SINTEF homepage for the TORC approach) is a game-based training for operational resilience capabilities. The TORC game is used as a baseline to be further developed so that TORC can be applied to specific DRMG CCs and the scenarios used in the DARWIN project, under the "D-TORC" label.

The pragmatic perspective of TORC is how to cultivate resilience and operate more flexibly, not only in combination with, but from within the "contextual shadow" of its opposite principle – compliance with rules. The overall aim is a reconciliation of rules and adaptive capacities into a functional whole, consistent with the (dynamic) operational conditions and contexts.

Organisations engaging in TORC training thus should acknowledge the challenge of manoeuvring "safely" in the overlap zone between the two principles. That is, they should aim to recognize, implement and develop the principles of resilience in an accountable and prudent manner, avoiding any temptation to overestimate resilient properties, in which case risk may increase.

TORC comprises three distinct but coherent training arenas with distinct but coherent objectives:

- **Operational** training: reveal, articulate, develop and demonstrate the needed margin of manoeuvre in complex operations (when procedures are insufficient);
- **Management** training: articulate, explore, maintain and manage a mandated space of manoeuvre in complex operations;
- **Integrated** training: establish, calibrate, reconcile and sustain the balance between margin and space of manoeuvre over time.

In D-TORC, the managerial-vs-operational differentiation can be applied at different levels, but the most typical appearance will be along the axis' of policy maker vs crisis manager, and crisis manager vs first responder.

Both the notion of a "margin" and a "space" are referred through a coarse notion of "resilience level". The actual levels are:

- **R1: Defend** normalcy (do additional work or preparation in order to enable compliance with rules)
- **R2: Build** robustness to anticipated disturbance (a specific response to a specific disturbance by recombining and/or extending normal response)
D3.4 Resilience Management Concepts and Application Tutorials

- **R3: Stretch** and rebound in an (isolated) surprising/unexpected situation/episode (by engaging large parts of the system beyond design base or presumed mode of operation)

The resilience levels (R1-R3) signify increasing levels of deviation from the compliance base (plans or procedures).

TORC training is operationalized through a dedicated board game, with supplementary information structuring the training situation/scenario, triggering events ("game changer cards"), resources available to solve the situation ("strategy cards"), and recording of the training process ("log poster").

![Figure 4-1: Training arenas and TORC game PAD](image)

There are three different modes of D-TORC operation; Emulation Mode (EM); Reconstruction Mode (RM); Simulation Mode (SM).

The D-TORC concept as such however comprises the three different modes of training as listed above, including the contextual material needed, as well as (possible) modification of the TORC PAD layout in order to improve harmonisation with DARWIN terms and definitions.

**4.1.3 D-TORC Emulation Mode (EM)**

D-TORC may primarily be used before and/or after an actual or conceived event. However, the (operational vs managerial) duality of the TORC training approach per se implies a possible emulation of and bridge between the before, during and after phases, respectively.

Hence, in Emulation Mode, a training session may emulate a managerial "before" phase in which context-specific details of the DRMG are clarified and substantiated, succeeded by an emulated "during" phase in which the operational side explores the validity of these substantiations, and followed by an emulated "after" ("after-action") phase in which integrated training conveys an evaluation and reconciliation between the presumed and the "actual" experience.

The basic preparation for Emulation Mode is to prepare the following training material in advance:

- procedures/plans as a compliance reference,
- the specification of initial situations and disturbances from which resilience is called for,
- and a set of resources, skills and strategies that organizations normally use. This comprises and frames the repertoire of the resilient response.

The typical training case is to link the EM training situation and material to a specific CC -and a specific context adapted to the trainees.
D3.4 Resilience Management Concepts and Application Tutorials

From the outset, EM training resembles original TORC training, requiring pre-training development of scenario, compliance base, disturbance(s) calling for a resilient response, and the specification of the conditions for the resilient response at different levels.

Intended disturbances may be formalised as *game changer* cards, and the skills/competences/strategies may be formalised as *strategy cards*, similar to the original TORC setup.

There are however two main types of D-TORC EM training, employing different sequencing of Managerial, Operational and Integrated training.

### 4.1.3.1 D-TORC EM Type 1: Exploring and validating a preconditioned resilient response

Here, managerial training is used to initially prescribe a set of strategy cards that frame and contain the presumed resilient response (at different levels) for the assumed situation. Next, operational training is conducted, limited by the predefined strategy cards (optionally given the option to reject, expand or substitute them). Next, integrated training is conducted in order to critically evaluate the (need to deviate from the) compliance base, the performance of the given resources for the resilience response, and/or the alternatives identified. Finally, the "resilience level" implied by the training is assessed.5

### 4.1.3.2 D-TORC EM Type 2: Exploring and assessing an "open" resilient response

Here, EM commences with operational training conducted in a manner in which trainees are guided by generic TORC strategies, and with an open option to invent new strategies as the situation changes. Next, managerial training is conducted as an after-action review, evaluating the adaptive path created by the operational team, with a critical assessment of their probability of success in a real situation. Finally, integrated training is conducted in order to select and preserve the most valuable strategies, critically evaluate the performance of the compliance base, and assess the proper resilience level.

### 4.1.4 D-TORC Reconstruction Mode (RM)

In addition, TORC training can also be used after a real situation, for the purpose of reconstructing an actual (real) episode, and learning from it. In essence, it resembles EM Type 2 training, but additional pre-training effort is needed to punctuate the real episode and identify the relevant investigation points, e.g. by use of a STEP diagram.

Hence, D-TORC RM training could also be used as a tool in a *real* after action review.

### 4.1.5 D-TORC Simulation Mode (SM)

Here, TORC training is conducted in the context of a simulation, from which the opportunity of exploring the limits of resilient operation is derived from the simulation sequence, and the D-TORC output is fed back to the simulation process.

Hence, D-TORC is used to "zoom in" on critical points in a simulation exercise, at which a halt is made in order to scrutinize critical choices/decisions, and to proceed by using the simulation tool (D3.3) to visualize the implications of the decisions made through TORC training.

The figure below illustrates the key features of D-TORC SM. A DARWIN (D3.3) simulation process is halted/interrupted at a point of time at which it is planned or expected that the current path will pose

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5 Note, to enable the full spectre of resilience levels, prescribed strategies must be subject to modification, expansion or replacement
problems or specific challenges. After making the halt, the simulator may be "speeded up" in order to visualize the expected (deteriorated) result.

Figure 4-2: Combining D-TORC and resources simulation

Next, a D-TORC EM (Type 1 or 2) training session is initiated in order for a selected group to create or choose among predefined resilient responses. Once the decision is made as part of the training, the simulator is fed with the modified parameters reflecting the chosen strategy, and the simulation proceeds.

4.1.6 Template for preparation of D-TORC training in organizations

As part of the TORC approach, a separate guidance document supports the trainee organization in preparation for TORC training (ref). In the table below, this advice is adapted to D-TORC, distinguishing between EM, RM and SM training.

Table 5: D-TORC preparation in different modes

<table>
<thead>
<tr>
<th>Main issue</th>
<th>Specific focus</th>
<th>D-TORC EM</th>
<th>D-TORC RM</th>
<th>D-TORC SM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitization for D-TORC training and development</td>
<td>Recognizing and understanding the potential for improved resilience</td>
<td>The trainee organization must recognize the value of managerial accountability for resilience, of maintaining a distinction between a managerial mandate and an operationally experienced margin for resilient performance, and the importance of their reconciliation supported by training</td>
<td>Recognize the value of training on hypothetical or emulated situations in order to learn about &quot;atypical&quot; experiences and practices beyond the design base of procedures and/or plans.</td>
<td>Mandate the use of D-TORC in learning from real events</td>
</tr>
</tbody>
</table>

The research leading to these results has received funding from Horizon 2020, the European Union’s Framework Programme for Research and Innovation (H2020/2014-2020) under grant agreement n° 653289.
<table>
<thead>
<tr>
<th>Main issue</th>
<th>Specific focus</th>
<th>D-TORC EM</th>
<th>D-TORC RM</th>
<th>D-TORC SM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial design and set-up</td>
<td>Define the scope of training to support the need for resilience</td>
<td>In the original TORC approach, a list of Training Targets (TT) is offered as a way of defining the &quot;resilience scope&quot; for the training. In D-TORC, the set of Concept Cards (CC) serve a similar purpose. Optionally, a mapping between TTs and CCs might be considered for enhanced clarity of scope. Select a range of Concept Cards (CCs) applicable as hooks or probes that can deliver input for a &quot;resilience repository&quot; in terms of descriptions and narratives exemplifying or resembling &quot;resilient performance&quot; according to scope.</td>
<td>Set up a list of CCs reflecting the scope of interest for learning from real events (if applicable, make a mapping to TTs)</td>
<td>Set up a (non-exclusive) list of CCs applicable for integration with simulation, consistent with the scope of the simulation, and the terms and conditions for interaction with the simulation process</td>
</tr>
<tr>
<td>Consolidating and priming the compliance base and safety management</td>
<td>Create a complete inventory of plans, rules and procedures related to chosen CCs Identify, a priori, any &quot;hooks and probes&quot; in the plans/procedures, and in the safety management system, that can be used to facilitate and leverage resilient performance. If possible, assess a priori experience and knowledge that can deliver input for a &quot;resilience repository&quot; in terms of descriptions and narratives exemplifying or resembling &quot;resilient performance&quot; according to scope Consider the possibility of defining (mere) recognition of such &quot;hooks&quot; and probes&quot; as a stand-alone exercise, or ensure, by other means, that they are known by the trainees. Consider the possibility of establishing an &quot;anomalizing&quot; approach or similar schemes in order to redefine a flexible set of modes of managerial intervention during training (e.g., ranging from allowance to modify rules, to opening up for free improvisation (&quot;MacGyver mode&quot;).</td>
<td>Restricted to the CCs selected for EM Restricted to the CCs selected for RM</td>
<td>Restricted to the CCs selected for SM</td>
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</tr>
<tr>
<td>Intake and familiarization process</td>
<td>Selection of people to be involved in the project (company focus group)</td>
<td>Establish a core/reference group to monitor and evaluate the training progression over time. Establish a tentative list of managerial and operational trainee groups according to chosen CCs and overall objectives. Note that a specific group can be both operational and managerial, depending on choice of CCs.</td>
<td>Align trainee groups and Allocate capacities to Allocate personnel</td>
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</tr>
</tbody>
</table>

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6 SINTEF report A279312, 2016, Table 2. See Ref (SINTEF homepage for the TORC approach)
<table>
<thead>
<tr>
<th>Main issue</th>
<th>Specific focus</th>
<th>D-TORC EM</th>
<th>D-TORC RM</th>
<th>D-TORC SM</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Type 1</td>
<td>Type 2</td>
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</tr>
<tr>
<td>Explorative interviews and (mini) workshop</td>
<td>Identify proper use cases in order to reveal practices and experience that can be used to link resilience to familiar practice, e.g., coping styles of operational teams when facing disturbances in normal operation</td>
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<tr>
<td>Document scan/review</td>
<td>Establish an overview of</td>
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<td></td>
<td>• Management ambition and vision for dealing with the unexpected</td>
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<td>• Policies on rulemaking and rule management</td>
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<td>• Policies on deviation and empowerment of first line supervisors and field staff</td>
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<td>• Hierarchy of procedures and instruction</td>
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<td>• (Signs of) Actual experiences with rule breaking</td>
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<td>• Relevant legislation and stakeholders upholding the compliance imperative</td>
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<td></td>
<td>• Other relevant training processes and programs</td>
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<tr>
<td>Selection of use cases, scenarios and possible capabilities</td>
<td>Identify use cases related to selected CCs, elaborate prerequisites necessary for realistic emulation.</td>
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<tr>
<td>Interviews with key employees</td>
<td>Explore to which degree the organization have a just, open or transparent culture that facilitate surprises emerging from D-TORC training, how (strictly) the compliance policy is maintained and enforced, the potential presence of “taboos”, and prevalent leadership styles. Validate the interviewee's understanding of their presumed roles, scout for persons with the potential of being operating as future D-TORC “super-users”</td>
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<tr>
<td>In-depth workshops on location</td>
<td>“Walk-through” of a (non-controversial) “normal” situation in which a “resilient” response is inevitable</td>
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<td>Elaborate the inventory of the presumed resilient response</td>
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<td>Select a situation that is widely recognised throughout the organization</td>
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<td></td>
<td>Select a “halt” situation that is widely recognised throughout the organization, and</td>
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<tr>
<td>Main issue</td>
<td>Specific focus</td>
<td>D-TORC EM</td>
<td>D-TORC RM</td>
<td>D-TORC SM</td>
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<tr>
<td>Identifying target group and start-up communication</td>
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<td>Formalise the training groups. Both managerial and operational groups are informed about the purpose and context of the forthcoming training, and the confidentiality related to controversies and opposite views, ensured.</td>
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<tr>
<td>Tentative training plan</td>
<td>Define the tentative training plan including dates. Define a tentative portfolio of use cases, including scenario descriptions and relevant game changers to initiate and drive the gaming activity.</td>
<td>If multiple CCs shall be subject to training, define and state the reason for CC sequencing,</td>
<td>Define contingencies for utilizing opportunities that emerge</td>
<td>Coordinate with simulation plans, identify the precise intervention points with the simulation</td>
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<tr>
<td>Substantiation of TORC Training development</td>
<td>Sources and inspirations of functionality addressed in Training Elements</td>
<td>The joint objective is to ensure that the impact of resilient responses are commensurable with the objective of the CC in focus, AND that the inventory is consistent with the key aspects of the relevant CCs</td>
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<td></td>
<td>Depending on the scope of the CC in question, the inventory can be close to or resembling &quot;normal&quot; operations, or it can be a case of introducing</td>
<td>Depending on the scope of the CC in question, it may be necessary to delimit the range of the &quot;invented&quot; or selected inventory</td>
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<td>Range of inventory is dependent on the link to EM, Type 1 or 2</td>
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<tr>
<td>Main issue</td>
<td>Specific focus</td>
<td>D-TORC EM</td>
<td>D-TORC RM</td>
<td>D-TORC SM</td>
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<td>Type 1</td>
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<td>something new and unknown. This choice has implications for scope and targets of operational, managerial and integrated training (see below)</td>
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<tr>
<td></td>
<td>Define scope and targets of operational, managerial and integrated training</td>
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<td></td>
<td>Plan a convenient “mix” and sequencing of training types, alternating between “experiencing a needed margin”, “articulating a mandate”, or “reconciliation” of the former two</td>
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<td>Define whether training should commence with operational, managerial and/or integrated training situations,</td>
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<td>Operationalize the scope of training (If desired, develop resource/strategy cards)</td>
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<td>Elaborate the inventory of the presumed resilient response.</td>
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<td>Elaborate an inventory of potential resilient responses, OR leave it open for the training groups to decide</td>
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<td>Delimit the range of potential resilient responses to events</td>
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<td>Prepare the training of the “halt” relative to preference for EM Type 1 or 2</td>
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</table>

### 4.1.7 Example of D-TORC Emulation Mode (EM) Type 1 and 2, targeted at a CC 3.2

Here, an example of preparation for EM training is provided by reference to:

CC 3.2. Establish the conditions for adapting during crises and other events that challenge normal plans and procedures.

The case chosen is the E.4 case in Darwin D4.2. "Initial Evaluation of the Guidelines". The E.4 case is about "Collision between oil tanker and passenger ferry leaving Gotland in severe weather conditions".
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The actors involved in this hypothetical D-TORC case will be the On-Duty Chief Medical Officer (CMO)\(^7\) in a managerial position, and the regional coordination function Collaboration Östergötland (CÖ)\(^8\) in the operational position. The activity targeted will be the coordination activity of the latter, presuming that there are plans/procedures in advance, under the supervision of the CMO.

<table>
<thead>
<tr>
<th>Table 6: D-TORC preparation in Emulation Mode (EM)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main issue</strong></td>
</tr>
</tbody>
</table>
| Sensitization for D-TORC training and development | Recognizing and understanding the potential for improved resilience | By choosing CC3.2, the CMO have implicitly recognized the value of managerial accountability for resilience of CÖ, of maintaining a distinction between the CMO mandate and the CÖ's operationally experienced margin for resilient performance, as well as the importance of their reconciliation supported by training. This is signified in the CC3.2. Introduction, and in the various notes on "before/during/after the crisis"

EM () training therefore supports the need to persistently address this crucial issue over time, thus building and maintaining trust in the capacity of the CÖ to autonomously judge and decide where and when to deviate from procedures in order to ensure resilience according to situational needs, and, repeatedly, before, during and after crisis, learn about "atypical" experiences and practices beyond the design base of procedures and/or plans.

For simplicity, contacts and commitment of training partners for collaboration is omitted here. |
| Initial design and set-up | Define the scope of training to support the need for resilience | Here, only CC3.2 is selected, and the scope of resilience training is informed through the descriptions of "nature of plans and procedures", "authority issues", capability issues" and "learning process" in CC3.2. These are also supported by the Training Targets\(^9\), which are operationalized though the TORC board game.

It would make sense to combine CC3.2. with other CCs, e.g., CC6.1. (Systematic management of policies involving policy-makers and operational personnel for dealing with emergencies and disruptions). In such a combination, the CMO "managerial" group of CC3.2. would correspond to the "operational" group of CC6.1. and relating to a higher level group of policy makers for Östergötland, or at a nationale lever. CC6.1 training could then "capitalize" on the results of CC3.2. training |
| Consolidating and priming the | Create a complete inventory of plans, rules and procedures related to the coordination function of CÖ. |

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\(^7\) Presuming that this is an "on-duty" role not possessed by a single person, the management training group can comprise several persons eligible for that duty

\(^8\) Also the Medical Coordination Staff or Hospital Coordination Staff at any of the three hospitals involved, could be an operational training group

\(^9\) SINTEF report A279312, 2016, p23, see (SINTEF homepage for the TORC approach)
### Main Issue

<table>
<thead>
<tr>
<th>Specific focus</th>
<th>D-TORC EM</th>
</tr>
</thead>
</table>
| **Compliance base and safety management** | Identify, a priori, any “hooks and probes” in the plans/procedures, and in the safety management system, that can be used to facilitate and leverage resilient performance. E.g., any step or decision point in the plans/procedures that allows for an alternative course of action.  
If possible, assess a priori experience and knowledge that can deliver input for a “resilience repository” in terms of descriptions and narratives exemplifying or resembling “resilient performance” according to scope. Presumably, there will exist a rich set of prior exercises as well as real events to draw from.  
Presumably, it will also be possible to rehearse on the (mere) recognition of such “hooks and probes” as a stand-alone exercise, or ensure, by other means, that they are known by the trainees (both CMO and CÖ).  
It is also presumed here that it will be plausible to distinguish between various CMO intervention during training (e.g., ranging from allowance to modify rules or choose among options, to opening up for free improvisation (“MacGyver mode”)). |
| **Intake and familiarization process** | The core/reference group to monitor and evaluate the training progression over time could be derived from the higher policy levels, but also from Medical/hospital Coordination Staff at local hospitals, or representatives of transport services.  
The tentative list of managerial trainees would be picked by from the "eligible" CMOs, the operational trainee groups from CÖ staff, novices as well as experienced  
In initial phase, it would be preferable that trainees operate in their presumed roles within the group setups. At a later stage, it could be beneficial to invite people to "emulate" other people's roles, in order to facilitate "perspective taking/making" effects |
| **Explorative interviews and (mini) workshop** | Choose and review 2-3 cases from the past two years in order to reveal practices and experience that can be used to link resilience to familiar practice, e.g., coping styles of operational teams when facing disturbances in normal operation |
| **Document scan/review** | Establish an overview of documents describing  
- Management (CMO and policy level’s) ambition and vision for dealing with the unexpected  
- Policies on rulemaking and rule management, CMO’s interpretation of these  
- Policies on deviation and empowerment of first line supervisors and field staff, CMO’s interpretation  
- Hierarchy of procedures and instruction  
- (Signs of )Actual experiences with rule breaking  
- Relevant legislation and stakeholders upholding the compliance imperative |
### D3.4 Resilience Management Concepts and Application Tutorials

<table>
<thead>
<tr>
<th>Main issue</th>
<th>Specific focus</th>
<th>D-TORC EM</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Type 1</td>
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<tr>
<td>Other relevant training processes and programs</td>
<td>Create a synopsis of plans/procedures that are applicable for CC3.2 in the presumed scenarios. Validate their completeness and usability, and prepare them as resources for the training activity.</td>
<td></td>
</tr>
<tr>
<td>Selection of use cases, scenarios and possible capabilities</td>
<td>Identify use cases related to the interaction between CMO and CÖ, including but not limited to the activation act, elaborate prerequisites necessary for realistic emulation of these.</td>
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</tr>
<tr>
<td>Interviews with key employees</td>
<td>Explore to which degree the CÖ environment represents a just, open or transparent culture that facilitate surprises potentially emerging from D-TORC training, how (strictly) the compliance policy is maintained and enforced by the CMO, and examine carefully the potential presence of “taboos”, including prevalent leadership styles. Validate the interviewee's understanding of their presumed roles, scout for persons with the potential of being operating as future D-TORC “super-users”.</td>
<td></td>
</tr>
<tr>
<td>In-depth workshops on location</td>
<td>“Walk-through&quot; of a (non-controversial) &quot;normal&quot; situation in which a &quot;resilient&quot; response is inevitable. It is presumed that there will exist &quot;normalized&quot; deviations that can be subject to a closer look. Elaborate the inventory of the presumed resilient response. Here, the CMP must be required to detail a presumed response by the CÖ in a few &quot;irregular&quot; situations.</td>
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</tr>
<tr>
<td>Identifying target group and start-up communication</td>
<td>Formalise the training groups. Both (CMO) managerial and (CÖ) operational groups are informed about the purpose and context of the forthcoming training, and the confidentiality related to controversies and opposite views, ensured.</td>
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</tr>
<tr>
<td>Tentative training plan</td>
<td>Define the tentative training plan including dates. Define the portfolio of use cases, including scenario descriptions and relevant game changers to initiate and drive the gaming activity The game changers could be, e.g.; unexpected restrictions on transport resources, managing additional resources, availability of human resources, goal conflicts, etc.</td>
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<tr>
<td>Substantiation of TORC Training development</td>
<td>Sources and inspirations of functionality addressed in Training Elements</td>
<td>Elaborate on</td>
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<tr>
<td></td>
<td></td>
<td>a. Resources and competencies (skills, knowledge and attitude) that are presumed ingredients to handle the planned deviations</td>
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<td>b. Strategies, heuristics and interactive patterns that are needed to transform the inventory from parts into a coherent action</td>
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<td>c. Organizational enablers and “lubricants” that may reinforce, amplify or sustain the process of leveraging and implementing</td>
</tr>
</tbody>
</table>

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The research leading to these results has received funding from Horizon 2020, the European Union’s Framework Programme for Research and Innovation (H2020/2014-2020) under grant agreement n° 653289.
<table>
<thead>
<tr>
<th>Main Issue</th>
<th>Specific Focus</th>
<th>D-TORC EM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Type 1</strong></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
<td><em>a resilience capability</em></td>
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<tr>
<td></td>
<td></td>
<td>Ensure that they are reasonably equally perceived by the training groups.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Validate their completeness and usability, and prepare them as resources for the training activity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The resulting inventory should be close to or resembling &quot;normal&quot; operations, due to the nature of the case (it is presumed that their actual experiences can be characterized as &quot;high variability&quot;)</td>
</tr>
<tr>
<td>Define scope and targets of operational, managerial and integrated training</td>
<td>The first step is to let the CMO group redefine a presumed response through playing the game &quot;on behalf&quot; of the CÖ.</td>
<td>The first step is to let the CÖ group(s) &quot;play&quot; the scenario, choosing from the predefined scenario, optionally allowing creation/invention of new inventory</td>
</tr>
<tr>
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<td></td>
<td>The second step is to let the CÖ group(s) &quot;play&quot; the same scenario</td>
</tr>
<tr>
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<td></td>
<td>The third step is to conduct a joint &quot;after action review&quot; in which both training group explain any deviations from their point of view, and then reconcile through discussion, preferably ending up with a joint view of a proper resilient response</td>
</tr>
<tr>
<td>Operationalize the scope of training (If desired, develop resource/strategy cards)</td>
<td>Elaborate the inventory of the presumed resilient response for practical use in the board game.</td>
<td>Elaborate an inventory of potential resilient responses for practical use in the board game, AND/OR enable the training groups to &quot;invent&quot; or introduce new options</td>
</tr>
<tr>
<td>Conduct training</td>
<td>Play the D-TORC game</td>
<td>Use the TORC Game Pad, or similar.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note that the &quot;resilience levels&quot; R1-R3 are not normative, neither by their &quot;level&quot; definition, nor in the sense that &quot;higher is better&quot;. Alternatives can be uses, but it is highly recommended that they depict a gradual scale for deviating from &quot;strict compliance&quot; to the maximum or &quot;utter resilience&quot; that the trainee organization can practically deal with or legitimately accept, and that the steps make sense for both the managerial and the operational perspectives</td>
</tr>
<tr>
<td></td>
<td>Log the activity</td>
<td>Use the TORC Game Log, or similar</td>
</tr>
</tbody>
</table>
4.1.8 Example of D-TORC Reconstruction Mode (RM) training targeted at CC3.1.

Here, an example of preparation for RM training is provided by reference to:

CC 3.1. Enhancing the capacity to adapt to both expected and unexpected situations

The case is also here the E.4 case in Darwin D4.2. "Initial Evaluation of the Guidelines".

As mentioned CC3.1., a regional major incident medical command is often formed by the same core staff in all incidents. This enables the management to be mobilised quickly and to accumulate experience in staff that are active in wide variety of events.

However, through D-TORC RM training, these acquired skills can also be fed into a joint repository of resilient inventories in the realm of the CÖ, and utilized in subsequent EM training based on CC3.2., as described in the previous section. The limitation of this is of course related to situatedness; the extent to which the essentials learned by the team can be made explicit and "handed over" EM training.

Presuming that a net benefit is possible, the example below thus can be read both as standalone RM training session based on CC3.1., but it can also be seen in conjunction with EM training based on CC3.2., facilitating a potential "boosting" effect on a core objective of CC3.1.

Sticking to the E.4 case in Darwin D4.2. "Initial Evaluation of the Guidelines", this D-TORC RM example posits the Collaboration Östergötland (CÖ) in the managerial position, while Medical Coordination Staff (MCS) or Hospital Coordination Staff (HCS) teams at any of the three hospitals involved, might be in the operational role.  

Table 7: D-TORC preparation in Reconstruction Mode (RM)

<table>
<thead>
<tr>
<th>Main issue</th>
<th>Specific focus</th>
<th>D-TORC RM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitization for D-TORC training and development</td>
<td>Recognizing and understanding the potential for improved resilience</td>
<td>The appreciation of the skills learned by the diverse experiences of the (MCS/HCS) operational teams implies an appreciation of the value of the operationally experienced margin for resilient performance, while the intent to feed them into an inventory also implies a recognition of the managerial responsibility of treating them as a common resource of resilience. By linking this RM training with CC3.2.-oriented EM training, managerial accountability for resilience and of maintaining a distinction between the mandate and the margin, as well as the importance of their reconciliation supported by training, is also ensured.</td>
</tr>
<tr>
<td>Initial design</td>
<td>Define the scope</td>
<td>The linking to CC3.1. is implicit. If a conjunction with CC3.2. (or others) is</td>
</tr>
</tbody>
</table>

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10 Alternatively, the MCS/HCF could also be conceived in a managerial role, while local, more specialized teams could be in the operational role. The "translation path back to the CÖ would then be in two steps, and the prospect of the "boosting effect" towards the prospected training on CC3.2., correspondingly lower.
<table>
<thead>
<tr>
<th>Main issue</th>
<th>Specific focus</th>
<th>D-TORC RM</th>
</tr>
</thead>
<tbody>
<tr>
<td>and set-up</td>
<td>of training to support the need for resilience</td>
<td>intended or part of the motivation, this should be stated. A mapping between original TORC TTs and CCs might be considered for enhanced clarity of scope.</td>
</tr>
<tr>
<td>Consolidating and priming the compliance base and safety management</td>
<td>To the extent possible, create a complete inventory of plans, rules and procedures related to the expected activity areas of the MCS/HCS. Restricted to the CCs selected for this RM</td>
<td></td>
</tr>
<tr>
<td>Intake and familiarization process</td>
<td>Selection of people to be involved in the project (company focus group)</td>
<td>Establish a core/reference group to monitor and evaluate the training progression over time. In this case, the CÔ as well as the CMO should take part in this. Establish a tentative list of operational MCS/HCS trainee groups. Allocate separate capacities to capture and organize information immediately after an event has occurred, or train the HCS/MCS groups to do it themselves</td>
</tr>
<tr>
<td>Explorative interviews and (mini) workshop</td>
<td>Invite the HCS/MCS teams themselves to identify proper use cases suitable for this purpose, both for the sake of value related to the objective, and for the sake of practicality related to their actual work.</td>
<td></td>
</tr>
<tr>
<td>Document scan/review</td>
<td>Establish an overview of the policy documents guiding the activities of the HCS/MCS staff, e.g.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Management ambition and vision for dealing with the unexpected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Policies on rulemaking and rule management</td>
<td></td>
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<tr>
<td></td>
<td>- Policies on deviation and empowerment of first line supervisors and field staff</td>
<td></td>
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<tr>
<td></td>
<td>- Hierarchy of procedures and instruction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- (Signs of )Actual experiences with rule breaking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Relevant legislation and stakeholders upholding the compliance imperative</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Other relevant training processes and programs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Create a capacity to identify and select an inventory of (ideally) applicable plans/procedures, during, or immediately after an event</td>
<td></td>
</tr>
<tr>
<td>Selection of use cases, scenarios and possible capabilities</td>
<td>Establish criteria for recognizing situations that match the selected use cases, approved by the users themselves</td>
<td></td>
</tr>
<tr>
<td>Interviews with key employees</td>
<td>Explore to which degree the teams have a just, open or transparent culture that facilitate surprises emerging from D-TORC training, to which extent they prefer to let information be in the tacit, the potential presence of “taboos”, and prevalent leadership styles affecting the group dynamics.</td>
<td></td>
</tr>
<tr>
<td>In-depth workshops on</td>
<td>Invite all teams to present a &quot;walk-through&quot; of a (non-controversial) &quot;normal&quot; situation in which a &quot;resilient&quot; response is inevitable</td>
<td></td>
</tr>
<tr>
<td>Main issue</td>
<td>Specific focus</td>
<td>D-TORC RM</td>
</tr>
<tr>
<td>------------</td>
<td>----------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Identifying target group and start-up communication</td>
<td>location</td>
<td>Select a situation that is widely recognised throughout the organization, and that function as a reference/baseline</td>
</tr>
<tr>
<td>Tentative training plan</td>
<td>Sources and inspirations of functionality addressed in Training Elements</td>
<td>Define the tentative interval for this training activity, but at the same time aim to integrate the RM &quot;after-action&quot; reviewing as a part of normal debriefing.</td>
</tr>
<tr>
<td>Substantiation of TORC Training development</td>
<td>The key objective is to ensure that the impact of resilient responses are commensurable with the objective of the CC in focus, AND that the inventory is consistent with the key aspects of the relevant CCs</td>
<td></td>
</tr>
<tr>
<td>Define scope and targets of operational, managerial and integrated training</td>
<td>Here, the key properties of the CC3.1. may function as an additional guide to the selection of matters of interest for the repository, e.g.;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. The nature of disruptions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Useful competences and skills</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Mechanisms (strategies, processes, tools) that should be in place prior to the situation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. Mechanisms that support adaptation (contingency plans, checklists, useful rules, buffers that can be integrated in plans, external support, flexibility in building and applying plans and procedures, capabilities to interpret situations and work out interventions accordingly, capability to adjust procedures in progress, etc)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>e. Strategies, heuristics and interactive patterns that are needed to transform the inventory from parts into a coherent action</td>
<td></td>
</tr>
<tr>
<td></td>
<td>f. Organizational enablers and &quot;lubricants&quot; that may reinforce, amplify or sustain the process of leveraging and implementing a resilience capability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If needed, the CÖ must predefine delimitations of the range of the &quot;invented&quot; or selected inventory</td>
<td></td>
</tr>
<tr>
<td>Operationalize the scope of training</td>
<td>This RM training is primarily operational, but the entry into the &quot;repository&quot; should be organised as integrated training, in which the CÖ should be more than one person.</td>
<td></td>
</tr>
<tr>
<td>Conduct training</td>
<td>Play the D-TORC game</td>
<td>Punctuate the reconstruction into adequate steps for using the TORC Game Pad</td>
</tr>
</tbody>
</table>
### 4.1.9 Example of D-TORC Simulation Mode (SM) targeted at a CC3.2.

For clarity, simplicity and for the purpose of making clear demarcations between EM, RM, and SM D-TORC training, we maintain the link to the E.4. case. For the same reason, we return to CC3.2., and provide an example of how EM (Type 2) training can be integrated with SM training. The simulation can be centred around the two main loops (bringing people to shore, and redistributing them to proper healthcare facilities). The disturbances leveraging a halt and a subsequent EM, as well as the possible strategies of resilient response, may be related to:

- Lacking own resources
- Managing additional resources
- Reallocation of tasks between actors
- Goal-conflicts
- Complexity
- Many stakeholders, issues at boundaries/interfaces
- ....etc

Also here, the CMO posits the managerial training position, while both the CÖ or the MCS/HCS staffs can posit the operational role associated with an interruption of the simulation process.

#### Table 8: D-TORC preparation in Simulation Mode (SM)

<table>
<thead>
<tr>
<th>Main issue</th>
<th>Specific focus</th>
<th>D-TORC SM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitization for D-TORC training and development</td>
<td>Recognizing and understanding the potential for improved resilience</td>
<td><strong>By choosing CC3.2 as the reference for interruptions of the simulation, the CMO have implicitly recognized the value of managerial accountability for resilience, of maintaining a distinction between the CMO mandate and the CÖ’s operationally experienced margin for resilient performance, as well as the importance of their reconciliation supported by training.</strong> Contact and commit owners and stakeholders of simulation processes and resources. Establish agreements on terms and conditions for interactions with simulation activities</td>
</tr>
<tr>
<td>Initial design and set-up</td>
<td>Define the scope of training to support the need for resilience</td>
<td>Identify CC3.2. as the main reference. However, if the overall training regime is larger than this SM training in isolation, a link to other CCs can be added.</td>
</tr>
<tr>
<td></td>
<td>Consolidating and priming the compliance base and safety</td>
<td>Create a complete inventory of plans, rules and procedures related to the presumed intervention of the selected operational group. As for EM in general, identify, a priori, any “hooks and probes” in the</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Main issue</th>
<th>Specific focus</th>
<th>D-TORC SM</th>
</tr>
</thead>
</table>
|            | management     | *plans/procedures, and in the safety management system, that can be used to facilitate and leverage resilient performance. E.g., any step or decision point in the plans/procedures that allows for an alternative course of action*  
  *If possible, assess a priori experience and knowledge that can deliver input for a "resilience repository" in terms of descriptions and narratives exemplifying or resembling "resilient performance" according to scope. Presumably, there will exist a rich set of prior exercises as well as real events to draw from.*  
  *Presumably, it will also be possible to rehearse on the (mere) recognition of such "hooks" and probes" as a stand-alone exercise, or ensure, by other means, that they are known by the trainees (both CMO and CÔ).*  
  *It is also presumed here that it will be plausible to distinguish between various CMO intervention during training (e.g., ranging from allowance to modify rules or choose among options, to opening up for free improvisation ("MacGyver mode")).* |
| Intake and familiarization process | Selection of people to be involved in the project (company focus group) | The core/reference group to monitor and evaluate the training progression over time could be derived from the higher policy levels, but also from Medical/hospital Coordination Staff at local hospitals, or representatives of transport services.  
  The tentative list of managerial trainees would be picked by from the "eligible" CMOs and hospitals, the operational trainee groups from CÔ staff, HCS/MCS, novices as well as experienced, according to the planned intervention points  
  Allocate personnel with capacity and competence to interact with the simulation process |
| Explorative interviews and (mini) workshop | Choose and review 1-2 cases from the past two years, associated with the specific intervention to be simulated. Reveal practices and experience that can be used to link resilience to familiar practice, e.g., coping styles of operational teams when facing disturbances in normal operation.  
  Pay specific attention to the possibility of operationalizing and feeding the training group's decision back to the resumed simulation process |
| Document scan/review | For the specific intervention situation(s), establish a minimum overview of  
  *Management ambition and vision for dealing with the unexpected*  
  *Policies on rulemaking and rule management*  
  *Policies on deviation and empowerment of first line supervisors and field staff*  
  *Hierarchy of procedures and instruction*  
  *(Signs of) Actual experiences with rule breaking* |
## D3.4 Resilience Management Concepts and Application Tutorials

<table>
<thead>
<tr>
<th>Main issue</th>
<th>Specific focus</th>
<th>D-TORC SM</th>
</tr>
</thead>
</table>
|            |                | - Relevant legislation and stakeholders upholding the compliance imperative  
|            |                | - Other relevant training processes and programs  
|            |                | Establish an inventory of all applicable plans/procedures relevant for the scope of integration with simulation/simulator  
| Selection of use cases, scenarios and possible capabilities | Identify possible punctuations of the simulation context, and derive use cases that link the situations with the selected CC3.2. |
| Interviews with key employees | Explore to which degree the operational environment selected represents a just, open or transparent culture that facilitate surprises potentially emerging from D-TORC training, how (strictly) the compliance policy is maintained and enforced by the CMO, and examine carefully the potential presence of “taboos”, including prevalent leadership styles. |
| In-depth workshops on location | "Walk-through" of a (non-controversial) "normal" situation in which a "resilient" response is inevitable  
| | Select a "halt" situation that is widely recognised throughout the organization, and that is easily implemented in the simulation |
| Identifying target group and start-up communication | Formalise the training groups. Both managerial and operational groups are informed about the purpose and context of the forthcoming training, and the confidentiality related to controversies and opposite views, ensured.  
| | The selection of trainee groups with operational/managerial roles must reflect the scope of the chosen CCs |
| Tentative training plan | Define the tentative training plan including dates. Define a tentative portfolio of use cases, including scenario descriptions and relevant game changers to initiate and drive the gaming activity.  
| | Coordinate with simulation plans, identify the precise intervention points with the simulation |
| Substantiation of TORC Training development | Sources and inspirations of functionality addressed in Training Elements  
| | Elaborate on  
| | a. Resources and competencies (skills, knowledge and attitude) that are presumed ingredients to handle the planned situations  
| | b. Strategies, heuristics and interactive patterns that are needed to transform the inventory from parts into a coherent action  
| | c. Organizational enablers and "lubricants" that may reinforce, amplify or sustain the process of leveraging and implementing a resilience capability  
| | d. Outcomes and decisions that are possible to feed back to the simulation process  
| | Ensure that they are reasonably equally perceived by the training groups.  
| | Validate their completeness and usability, and prepare them as |

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### 4.1.10 Advantages and limitations from the proposed D-TORC approach

As demonstrated above, it is possible to adapt the original TORC approach to the Darwin context.

The development from TORC to D-TORC is characterized by the distinction between Emulation Mode (EM), Reconstruction Mode (RM) and Simulation Mode (SM), by the direct linking to Concept Cards (CC) as sources for training objectives and targets, and by using the pre-existing E.4 case as an example for D-TORC application.

It is therefore reasonable to assume that there is a high potential for D-TORC being expanded to other CCs, as well as other cases.

The above exemplification is (4.1.6 – 4.1.9) is derived from the original TORC template for bringing TORC in as part of an organization development (OD) process. This supports the prospect that a "DCoP" member can build an even more comprehensive and elaborate portfolio of training cases addressing different CCs and case areas. The potential drawback is that such an OD process may demand too many resources and effort. The argument can however be made that once this extensive OD effort is invested, the marginal cost of extending the scope will be dramatically decreased. Prior TORC experience (SINTEF homepage for the TORC approach) suggests that it easily scales up to almost 100 trainees for a common scope. Although an extended (CC) scope will require distinct preparation, it is presumed here that also a D-TORC approach will benefit from initial investments over time.

However, there is a need to make some generic cases that can easily, with minor preparation, be used across several domains to motivate the further use of D-TORC.
D3.4 Resilience Management Concepts and Application Tutorials

4.1.11 D-TORC conclusions and next steps
Most of the modes present potential ways to apply the D-TOC approach. There is a need to verify the capability to address a broader selection of CCs, and case area. The link to the E.4 case is hypothetical and must be verified, especially regarding simulation. Within the project, an experiment is required considering a minimum viable solution e.g. D-TORC game and Emulation Mode to identify the added value in terms of understanding resilience management and concept cards presented in the DRMG.

There is a need to verify that marginal costs decrease, and there is a need to develop generic, low-preparation, "just play it" examples, for motivating further effort.

4.2 Resilience Management Academic Course

4.2.1 Background
The DARWIN project aims to develop state of the art resilience guidelines and innovative training modules for crisis management. Building an academic course based on the knowledge and perception that had developed through this project is part of the second goal. This course is actually a translation of the DARWIN’s perception of the resilient management process to an available format for academic lecturers. The course structure was influenced by the results of former stages of the DARWIN project: WP1 and T2.1. WP1 provided the conceptual perception, while D2.1 improved the requirements of the resilient management process.

The course was also compared to internationally existing trainings administered by academies, governments, and private sector organizations, with the aim of providing state of the art academic and hands on practical knowledge based on the Israeli experience.

4.2.2 Methods
The structure of the proposed academic course was developed based on the outcomes that were achieved in former stages of the DARWIN project. The study design through three phases:

Development the course structure- The DRMG that identified among former stages of the DARWIN project are guidelines at a meta-level, providing a macro perspective on the resilient management processes. The building blocks of the guidelines are the Concept Cards (CC), synthesising knowledge captured during WP1 (mainly literature review and interviews.). CCs propose specific interventions in order to develop and enhance the resilience management capabilities captured in the conceptual requirements. One of the main components developed in T2.1 was a DRMG Map, organising the CCs in a concept map. The map is used for both knowledge representation and development purposes. Based on the DRMG Map, the course models were determined, reflecting the holistic view of the resilient management process. Based on it, seven modules describe the resilient management process, relating to the life cycle of events starting from the pre-emergency period, through the crisis itself and during the after emergency time. Additional two modules focus on exercising and implementation of the acquired knowledge by the students (modules six and seven).

Writing the course modules- the course modules have been written by content experts in both arenas of disaster resilience, as well as in the field of academic teaching. The writing process reflects the experience of the writers along side recent professional literature. Each module includes relevant CCs according to DARWIN project; an abstract describing the summary of the module and learning outcomes. In order to demonstrate the teaching of the course, two presentations were developed dealing with the explanation of the all hazard approach and community resilience assessment. These topics were selected in accordance with the needs raised by WP4 members, to help them in explaining these issues among the pilot cases.
After reviewing and revising the course modules, updating the titles of modules and the subjects that the course discuss the Content expert conducted a critical review at the end of the writing process. Special attention had been given to the relationship and overlaps between modules, along with identification of missing content that the authors thought should have been included in the course syllabus.

### 4.2.3 Resilient management course syllabus

**Course goals:**

- To provide the students with a broad perspective on the resilient management of disasters and emergency situations over the timeline sequence as reflected in the DARWIN project.
- To understand the concept of resilience as a holistic approach.
- To recognize the terminology and key areas of resilient management according to the DARWIN perception.
- To understand the impact of a disaster on communities, organizations, infrastructure and the interfaces between them.
- To identify factors that should be considered in building an Emergency Management response plan: guidelines and standard operational procedures (SOP’s), a balance between plans and the need for improvisation (adaptation); identifying inadequacies and prompting dynamic organizational learning.

**Learning outcomes:**

- The students will be familiar with the perception, terminology and the key areas of resilient emergency management
- The students will understand the impact of emergency situation on individuals, community, organizations, infrastructures and the interface between them.
- The students will recognize relevant essential factors for building of a multi-dimensional response plan for emergency.
- The students will implement the theoretical knowledge learnt by building response plans to simulated scenarios.
- Note: According to the vast information that is provided in this course, the lecturer should decide which implementation module will be used: presentation of students projects (module six) or table top presentation (module seven). The course program presents them both.

** Effort:** 3-4 hours per week

**Credit:** 4.5 ECT

**Length:** 11-13 weeks

- The learning modules and sessions of the academic course are presented in figure 4-3.
4.2.4 Learning modules

4.2.4.1 Module One: Darwin overview of resilience- Review, terminology, Key Areas (based on Darwin Literature Review)

2 sessions.

Related requirements according to DRMG Map:

<table>
<thead>
<tr>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRMG approach, principles and objectives</td>
</tr>
<tr>
<td>Resilient management VS others</td>
</tr>
<tr>
<td>Terminology</td>
</tr>
<tr>
<td>Development of education program on RM</td>
</tr>
<tr>
<td>Expected impact</td>
</tr>
<tr>
<td>Resilience abilities</td>
</tr>
</tbody>
</table>
Abstract

Resilience is a concept that had come from the fields of physics and the exact sciences. Since then, the perception of resiliency has been expanded and was implemented among various arenas, describing the ability of individuals, communities, organizations and systems to deal with changes, disruptions or emergencies. Gradually, the concept of resilience became a core notion in the field of Disaster Risk Reduction (DRR). As such, current Local, international and global frameworks have been developed.

The DARWIN project aims to develop state of the art resilience guidelines and innovative training modules for crisis management. The guidelines, which will evolve to accommodate the changing nature of crises, are developed for those with the responsibility of protecting population or critical services, and to transform relevant policies to practice.

The guidelines address the following resilience capacities and key areas: capability to anticipate, to monitor, to respond and adapt (readiness to respond to the expected and the unexpected), and capability to learn and evolve. Key areas of the resilient management according to DARWIN: social media and crisis communication; living and user-centred guidelines; continuous evaluation and serious gaming. In the first stage of the DARWIN project, interviews with experts and a systematic literature review were conducted. 440 articles were analyzed in this study, reflecting the variety of disciplines regarding resilient management. About 300 definitions of resilience were identified, and approaches concepts and practices were recognized. These were the basis for the requirements that would be translated in the further phases of the DARWIN project to concept cards (CC). Although the project focuses on two main fields, healthcare and air traffic management, the basic approach is to provide general guidelines for different kinds of emergency situations. Thus, aim to support organizations in developing and enhancing their resilience in the context of crisis management (DARWIN, 2017). The first stage of the DARWIN project was to understand perspectives on resilience management as reflected in the professional literature. Four categories are used to qualify (and organize) the CCs: general themes, functions of crisis management, resilience abilities, and users. Mechanisms also exist to describe potential relationships between CCs. The CCs relate to all phases of the emergency cycle: from the pre-emergency to the post emergency phases, providing implement components of specific requirement among the resilient management.

Learning outcomes:

Students will be acquainted with the human response to crisis and will learn the implications on the learned response on planning and administering a resilience management.

Central aspects of the training (in conjunction with DARWINs’s perspective) include:

1. To be familiar with the development of the resilience concept from the exact sciences to current perception.
2. To know the DRMG approach, principles and objectives.
3. Understanding the uniqueness of the resilient management VS others- DR-035
4. To know the DARWIN terminology and key areas in the resilient management- DR-038
5. To implement the expected impact and the resilience abilities in resilient management- DR- 079; 081

Evaluation of the understanding and implementation capacity of the materials will be through Modules six or seven.
4.2.4.2 Module two: Effects of crisis on individuals, organizations, communities and infrastructures and interfaces between them

1 Session.

Related requirements according to DRMG Map:

<table>
<thead>
<tr>
<th>Content</th>
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<tbody>
<tr>
<td>Understanding operational environment/ Context</td>
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<tr>
<td>Public Key Needs</td>
</tr>
<tr>
<td>Characteristics of community</td>
</tr>
<tr>
<td>Address critical infrastructure needs</td>
</tr>
<tr>
<td>Learning from everyday operations and practices management</td>
</tr>
</tbody>
</table>

Abstract

Resilience management is about the response of systems to changes and most accurately, to stress as a response to crises and disasters. Hence the foundations of managing stress inducing situations is obviously through an in depth understanding of the human behaviour or the human factor in potentially stressful events. This understanding is vital for setting up the functional context for resilience management.

The term system in reference to human response describes the entire spectrum starting with the individual, going through families, communities, organizations, nations and up. Naturally when looking at the effects of change, especially to the extent that a change happens through crisis and disasters, the assessment of ramifications and implications of that change refer to human response and to the infrastructure response that has an additional potentially stressful effect which must be played in by emergency managers. Training syllabus will refer first to the understanding of the individual response to crises, the family as the basic organizational unit, and finally to the community, especially in terms of municipalities that are considered the core element or the foundation for effective community emergency management.

Learning outcomes

Students will be acquainted with the human response to crisis and will learn the implications on the learned response on planning and administering a resilience management.

Central aspects of the training (in conjunction with DARWINS’s perspective) include:

1. Understanding the operational environment – setting up the context for resilience management
2. Public key needs in crisis situations- DR-040
3. Characteristics of communities- DR-44
4. Critical infrastructure needs- the influence on the community -DR-060
5. Learning from everyday operations and practices – implementing the lessons learned in Israel and international in actual management

Evaluation of the understanding and implementation capacity of the materials will be through Modules six or seven.
4.2.4.3 Module three: Resilience as a holistic concept - Assessing resilience, co-operation, co-ordination, interfaces, networking

3 Sessions

Related requirements according to DRMG Map:

<table>
<thead>
<tr>
<th>Content</th>
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<tbody>
<tr>
<td>Assessing resilience</td>
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<tr>
<td>Monitor readiness to respond</td>
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<tr>
<td>Noticing brittleness</td>
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<tr>
<td>Identifying sources of resilience</td>
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<tr>
<td>Community resilience assessment</td>
</tr>
<tr>
<td>Supporting cooperation and synchronization of distributed operations</td>
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<tr>
<td>Establishing and reinforcing networks</td>
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<tr>
<td>Understanding goals and responsibilities</td>
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<tr>
<td>Managing interdependencies</td>
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<tr>
<td>International collaboration</td>
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<tr>
<td>National collaboration</td>
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<tr>
<td>Local Collaboration</td>
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<tr>
<td>Joint training to ensure collaboration</td>
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</tbody>
</table>

Abstract - Assessing and monitor resilience and brittleness

One of the distinctions of the resilience concept stems from identifying resources and weaknesses of the relevant entity. This uniqueness shifts the notions of resilience from theoretical concepts to an evidence-based model. Assessing resiliency is a complicated mission, since the components of resilience encompass both physical and preceptual aspects. There is no “gold standard” or benchmark for assessing resilience: The complexity of the term, the various content worlds dealing with resilience and the vague definitions of resiliency make it difficult to conduct a comprehensive measurement process. A systematic literature review done by the first stage of DARWIN project, discovered 65 different methods to assess resiliency, but only a few of them, were cited more than one time. This situation is true for assessing resilience in organizations, economics, agencies and communities. As such, it is important to use a validated tool for the measurement procedure. Beyond this complexity to measure resilience, there are numerous indicators for the importance of validated procedures. The basis for a good resilient management is the creation of an up-to-date status evaluation that relates to existing strengths and weaknesses.

The assessment process occurs throughout all phases of the emergency cycle: from the pre-emergency period, through the crisis itself and in the recovery and rehabilitation phases as in the post emergency period. During the pre-emergency phase, assessment creates a base line score. Based on this measurement, policy makers may build intervention plans aimed to strengthen resilience. Assessment
D3.4 Resilience Management Concepts and Application Tutorials

during crisis intents to assess the impact of the emergency situation, while the measurement after crisis may explore rehabilitation processes. Noticing brittleness, aims at understanding and addressing potential pitfalls, even if they are not yet manifested in catastrophic outcomes. Brittleness can reflect a variety of difficulties, including: lack of resources, difficulties to adjust, lack of information, goal conflicts, constraints and bottlenecks, limits of mitigation plans, difficulties to learn from the crisis and previous events. Identifying these points of weaknesses may increase the capacity to manage emergency situations.

Assessing community resilience- there are many definitions for the word "community". In the context of emergencies, it is acceptable to refer to a local community with geographical boundaries. In the virtual era, the meaning of community is redefined, which in turn may affect the behavior of communities under emergency circumstances. Community resilience reflects the community’s ability to respond and react to local and global threats. During the last decades the civilian population is exposed all over the world to an increasing number of emergency situations, and the role of first responders is becoming ever more significant. As such, it is important to strengthen the public. Community resilience reduces response times to crises and mitigates the community’s reaction to them. Similar to the broad concept of resiliency, community resilience encompasses physical and perceptual factors. Assessing them, may provide a reliable information for decision makers about the ability of their communities to handle extreme situations. There are two main approaches to assess community resilience: bottom up- hearing the voice of the community members, understanding their attitudes and feelings regarding their community; and, a Top-down approach- searching objective databases, trying to translate the outcomes to community resilience scores. A mixed methods research conducted by a group of experts had found five factors for community resilience: leadership, collective efficacy, preparedness, place attachment and social trust. The Conjoint Community Resilience Measurement (CCRAM) - a validated tool for assessing community resilience, identified attributes of community resilience by cross sectional and longitudinal studies. These studies portrayed a unique profile for each community, considering natural and cultural aspects.

Learning outcomes:

Central aspects of the training (in conjunction with DARWINS’s perspective) include:

1. To be familiar with the importance of assessing resilience, brittleness and community resilience as part of resilient management. (DR-71; 72; 83-A-B-C)
2. To know the complexity of the resilience and brittleness assessment.
3. To understand the importance of conducting longitudinal studies in order to identify community trends in resilience scores.

Evaluation of the understanding and implementation capacity of the materials will be through Modules six or seven.

Abstract- Supporting cooperation and synchronization of distributed operations

The scope of the emergency situation determines the range of agencies participating the response plans. The larger the event and the longer its duration, the greater the involvement of organizations, infrastructures, agencies and communities. In order to manage comprehensive preparedness and response plans for various types of events, it is important to promote collaboration and coordination between relevant organizations. In many situations, the relevant elements could be from different structure types, for example: coordination between military and civilian organizations, or private and public sectors. The coordination is one of the core elements of the resilient management, since it requires building a process that includes legal, practical and personal aspects. The collaborations should take into account vertical and horizontal relationships in order to promote local, national and international collaborations and
coordination. Coordination between different organizations should be carried out at all levels: from the first responders, through the management level and among decision makers. Therefore, it is important to build common grounds personal relationships and networks between lateral actors prior to the crisis, which in turn, would encourage effective communication when necessary. Collaboration requires defining the roles and responsibilities of each relevant element in order to clarify functionality and reduce interdependencies. As such, it is important to create drills and situations during routine time for simulating emergencies in order to advance efficient collaboration in real time.

The involvement of physical, perceptual, personal and infrastructural elements in the resilient management requires special attention to the issue of interfaces between them. Additionally to relationships between actors from different agencies, there is a range of associations between diverse dimensions, including individuals and communities, infrastructures and human aspects, services and/or physical means and individual perceptions. For example, there is a positive correlation between a failure of critical infrastructures and the resiliency of the public. In parallel, it is possible to maintain a functional continuity of infrastructures during an emergency only when there is a positive involvement of the workers (public). Studies explore that maintaining work of personnel during an emergency becomes possible by creating physical resources, but it is influenced mainly by strengthening the sense of belonging of employees to their organization, their cohesiveness and other perceptual aspects. As such, conducting an efficient resilient management involves rigor thinking on potential interfaces of different dimensions, in various levels throughout the emergency cycle.

Learning outcomes:

1. Central aspects of the training (in conjunction with DARWIN’s ’s perspective) include:
2. To understand the importance of collaboration/coordination between horizontal and vertical relevant stakeholders
3. To know the significance of creating common grounds and networks prior to crisis between relevant actors during the pre-emergency period.
4. To recognizes potential pitfalls in building the collaboration between organizations.
5. To understand the importance of interfaces between divers elements in the resilient management.

Evaluation of the understanding and implementation capacity of the materials will be through Modules six or seven.

In summary module three:

Three elements advance resilience as a holistic concept: First, the assessment process that identifies needs and resources, exploring reliable information on variety of populations and situations. The second: building horizontal and vertical collaboration, strengthens the relationships among relevant actors. The third element deals with the interfaces between different dimensions. Paying attention to these factors supports the capacity of adaptation, enables the provision of response to large scales of populations and organizations. In accordance with the resilience as a holistic concept, it is important to mention the importance of ethical issues of the resilient management. This includes various aspects, including for example: providing response while maintaining fairness and justice, and paying attention for vulnerable population needs.

4.2.4.4 Module four: Organizational Aspects of Resilience- All hazards Approach, SOP’s-

Developing and assessing plans, system failure, organizational learning (balance between plans and improvisation)

2 Sessions
### Abstract

Organizational aspects of resilience management should be integrated in policy-making and actions during the full range of the crisis cycle: from the pre-emergency to the rehabilitation phases. The pre-emergency phase is a critical stage in the emergency cycle, since, during this time, it is essential to create a preparedness framework for optimal performance during emergency. Organizations should ensure their support of capacity adaptation for both expected and unexpected situations. This may be achieved by anchoring plans on two elements: “All hazard approach” and the principle that relevant actions during emergencies should be based on routine operations. All hazard approach is the creation of a broadest possible common denominator for emergency situations. It refers to the shared elements of various types of disasters; it can be addressed in a general plan; the plan can provide the basis for responding to unexpected events, and plans have to be adaptable and improvisational. As such, it is important to develop a hierarchical mapping of threats, portraying their characteristics beyond needs and resources. In developing the preparedness and response plans, the first stage should aim at creating generic plans, while the second should focus on the specificity of each scenario. Basing the actions during emergency situations

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### Related requirements according to DRMG Map:

<table>
<thead>
<tr>
<th>Content</th>
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<tbody>
<tr>
<td>Developing and revising procedures and checklists</td>
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<tr>
<td>Various magnitudes and complexities of events</td>
</tr>
<tr>
<td>Clear and not open to interpretation</td>
</tr>
<tr>
<td>Developing, assessing and revising plans</td>
</tr>
<tr>
<td>National contingency plans</td>
</tr>
<tr>
<td>Immediate response plans</td>
</tr>
<tr>
<td>Planning based on routine operations</td>
</tr>
<tr>
<td>Developing, revising and conducted training</td>
</tr>
<tr>
<td>Training for resilient management</td>
</tr>
<tr>
<td>Worst-case scenario</td>
</tr>
<tr>
<td>Enable personnel to improvise</td>
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<tr>
<td>Different magnitude</td>
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<tr>
<td>Implementing organizational resilience</td>
</tr>
<tr>
<td>Learning across organizations</td>
</tr>
<tr>
<td>Managing System failure</td>
</tr>
<tr>
<td>Alternative working methods</td>
</tr>
<tr>
<td>Backups</td>
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<tr>
<td>Standards to ensure reliable system</td>
</tr>
</tbody>
</table>
on routine operations increases the familiarity of actors with required actions. In developing response plans, the issue of resources management is critical. Resources relate to various categories of, including equipment, personnel infrastructure or services, but should be meaningful for the organization. It is important to keep the redundancy and diversity of the resources with accessibility when needed.

Within the process of developing preparedness and response plans, it is important to distinguish policy making from Standard Operating Procedures (SOP’s) development. While the policy reflects a holistic-strategic point of view, the SOP’s or checklists have a tactical significance, relevant to each organization and department. SOP’s present an inherent duality: on one hand, it is important to write clear operating procedures that are not open to interpretation, while on the other hand; it is crucial to maintain the ability of the actors to adapt their decisions to to real time changing situations. Actually, the balance between plans and improvisation and adaptation is the core element of the effectiveness of response plans.

Organizational training is a milestone in the organizational learning process. The training aims to validate, test and revise existing plans. There are differences among countries and disciplines dealing with the responsibility and evaluation of designing the scenarios for training- The government and military or the specific organization itself. The training design should consider: the main objective of the training and its format (drill, tabletop exercise, simulations); advanced preparation and training of scenario and relevant personnel, collaboration with relevant actors, identified needs and internal and/or external resources. Relevant aspects that have to be addressed additionally to organizational training include: information and communication with the public and among response actors, evacuation of casualties, security perspectives and, short and long terms influence of the scenario. The complexity of the scenario affects the scope of the training design. During the training itself, it is important to use existing guidelines and SOPs. Reviewers should assess the training conduct. After the training, it is important to evaluate it with several methods: debriefing of the involved actors, external assessment, and effectiveness of guidelines. According to the evaluation outcomes, the need to revise SOPs, checklists and scenarios will be examined in order to assess plans and implementation. Some doctrines hold that it is important to incorporate external organizations in the training evaluation process. According to them it promotes cross-organizations learning that is essential for advancing the capacity of organization to be adaptive.

During the crisis itself, several actions have to be taken: identifying the crisis, recruitment of personnel and volunteers, assessment, declaration of emergency, implementation of response plans, internal and external communication and information, resource management.

**Learning outcomes:**

Central aspects of the training (in conjunction with DARWIN’S’s perspective) include:

1. To be familiar with the importance of organizational resilience perceptions during all phases of the emergency cycle.
2. To know the importance of designing preparedness and response plans.
3. To understand the importance of anchoring response plans on the "all hazard approach" and the foundation of emergency operations on routine procedures and operations.
4. To understand the importance of the capacity for adaptivity within pre written and practices SOP's.
5. To understand the importance of evaluation processes and their outcomes' implementation I emergency management SOP's design.

Evaluation of the understanding and implementation capacity of the materials will be through Modules six or seven.
4.2.4.5 Module five: Emergency (risk) communications- Public involvement, social media (incorporating advanced technology)

2 Sessions

Related requirements according to DRMG Map

<table>
<thead>
<tr>
<th>Content</th>
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<tbody>
<tr>
<td>incorporating advanced technology</td>
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<tr>
<td>RM supporting system</td>
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<tr>
<td>Tools for communication</td>
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<tr>
<td>Communication between policy makers and first responders</td>
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<tr>
<td>Involving the public in resilient management</td>
</tr>
<tr>
<td>Interaction with the public</td>
</tr>
<tr>
<td>Established trust in leaders and authorities</td>
</tr>
<tr>
<td>Established trust between responders and population</td>
</tr>
<tr>
<td>Public not yet involved</td>
</tr>
<tr>
<td>Public on site</td>
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</table>

Abstract

The importance of risk or emergency communication in today’s world is best manifested in international organizations manuals such as the OECD definition of the need: "Risk communication is a fundamental element of a sound risk management framework that seeks to reduce future losses and damages from disasters." (OECD p17). The terms risk, crisis and emergency communications often interchange and used as one, yet the OECD manual tries to distinguish by stating that risk communication needs to be done before a hazardous event occurs, to inform citizens and businesses about their potential exposure and to encourage them to invest in precautionary measures to avoid, reduce or transfer these risks. In contrast, emergency and crisis communication needs to inform people once the event is imminent, has already begun or has just occurred. Risk communication then comes to the fore again in the aftermath of disasters, to make sense of what happened. American CDC agency (Center for Disease Control) states that definitions are often too narrow and suggests that crisis communication may be defined as the set of “activities of an organization or agency facing a crisis to communicate about that crisis to their organization, various partners, and the public” (CDC 2014 p7) Crisis communication” is closely associated with emergency management and the need to inform and alert the public about an event. Risk communication is about the expected type (good or bad) and magnitude (weak or strong) of an outcome from a behaviour or exposure. It is in nature informative and educational or as was defined by Sandman "Risk communication is at least two quite different tasks. When a risk is small in the experts’ judgment and people are excessively alarmed, the job of risk communication is to reassure them. When the experts consider the risk substantial and people are insufficiently concerned, the job is to warn them". Sandman’s comments are connected to yet another aspect of risk communication: the connection between risk or emergency communication and management. Combs (2015) claims that crisis communication is what gives life and substance to crisis management. Successful crisis communication determines the success of emergency management.
With globalization and web use developments almost every aspect of human communication has changed (Falkheimer, Heide & Larson 2009). Speech, listening, writing, social media and internet publishing “have created a space for every single person to be their own journalist and reporter” this is naturally a call for emergency and risk managers to realize the new dimensions of action within the field without losing the main principles of traditional communication as many world users are not yet culturally competent with new media and may be defined as digital immigrants, and because new media principles are still based on traditional needs of populations in times of need. One such discussion is in regard to the life cycle of crises (events). The CDC manual reflects the traditional cyclic phases’ perspective:

The cycle starts with a pre-event phase which calls for preparedness- Be prepared. Initial phase: Acknowledgment. Explaining and informing the public. Establishing agency and spokesperson credibility. Maintenance- Helping the pubic more accurately understand its own risks. Providing background and encompassing information to those who need it. Resolution - Improving appropriate public response in future similar emergencies through education. Examining problems and mishaps, and then reinforcing corrections in the recovery and response efforts. Evaluation - evaluating communication plan performance. Naturally as the circle goes full round, the system has to be ready for future events.

In contrast to this traditional perspective, Bäckström & Svensson suggest that rather than looking at stages of crises, new reality of crises and emergency communications is looking at determining factors such as leadership, proactiveness, well prepared strategy, integration of social media within the organizations, and understanding of the multi-cultural dimensions of a strategy.

This new perspective embeds new tensions. One of them is the tension between a well-prepared plan and the ability to change and adapt. Another tension regards the interactivity level of recipients or populations. Lundgren and McMakin (2013) claim that participation in an interactive emergency communication creates enhanced interest of the audience that may translate into willingness to change behaviors as directed. Hence the proposed role of social media in crisis is: 1) Share information 2) Create an interactive channel of communication 3) Evaluate community perceptions of the crises 4) Downside- no control over public reactions

Throughout the references and especially in hands on practice, the issue of leadership appears as a red thread. Discussion on emergency and risk communications cannot turn away from dealing with the deep connection between leadership styles and communication in regular times and especially in crises. It also projects another strong affinity between communication to the concept of community and organizational resilience.

**Learning outcomes:**

Central aspects of the training (in conjunction with DARWIN'S's perspective) include:

1. To understand the significant role of risk and emergency communication in emergency management
2. To understand the process of crises and risk communications
3. To learn the centrality of social media in crises and risk management
4. To understand the connectedness of risk and emergency communications with leadership
5. To learn the principles of proactive communication strategy

Evaluation of the understanding and implementation capacity of the materials will be through Module six via students' projects presentations, and Module seven through the table top simulations.
4.2.4.6 Module six: Students projects presentations

4.2.4.7
2 Sessions

Abstract
The discipline of resilience management is a true example of the need for combined academic and hands on practical effort. Students may come as individuals wishing to further their knowledge, or as practicing professionals from an array of disciplines and combination of practices to enhance their professional ability, and /or to bring back the state of the art materials to their home organizations. This unique continuum of students' profiles, combined with the practical aspects of the course calls for a methodology that incorporates a number of elements:

1. Presentations of academic materials
2. Presentations of hands on practices
3. Discussions in a workshop style
4. Opportunities to implement within a learning environment

While the first 3 elements are deeply embedded within the course sessions, the element of implementing and assessing the materials against a student's home organization within a learning environment must be created. This opportunity is created in the form of students' projects. Throughout the sessions students will be asked to consider the implementation of the learned materials in their own organizations. Students that do not belong to an organization will have to practice on a theoretical level with an organization they may be familiar with.

Towards the end of the course and before the simulation session, the students will present in class, as a way of peer learning, a project where they will introduce at least one element learned in the course as they understand it in their own organization. It may be in presenting existing procedures, understandings, or preparedness plans, etc. or lack of such capacities’ and the way the students will recommend to bridge gaps over the missing elements.

Learning Outcomes
Student will through the writing and presentation of their projects in the classroom gain:

1. Implementation of the learned materials
2. Evaluation of internalization of the materials
3. Opportunity to test the learning materials against the students home organizations in a safe learning environment before taking the materials back to home organizations
4. Opportunity for peer learning
5. Discussion on cultural differences and planning for cultural adequacy
6. Learning feedback processes
7. Opening for further research ideas
4.2.4.8 Module seven: Integration – Managing adaptive capacity and Key Areas- tabletop simulation presentations

2 Sessions

Related concept cards according to DRMG Map

<table>
<thead>
<tr>
<th>Content</th>
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<tbody>
<tr>
<td>Managing adaptive capacity</td>
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<tr>
<td>Adaptation relative to procedures</td>
</tr>
<tr>
<td>Polycentric control</td>
</tr>
<tr>
<td>Managing resources</td>
</tr>
<tr>
<td>Adaptation relative to events (scope, nature, unexpected, ect.)</td>
</tr>
</tbody>
</table>

Abstract

The integration phase of the various modules will be done by use of tabletop simulations. Simulation is a technique for practice and learning that can be applied to many different disciplines and trainees. It is a technique (not a technology) to replace and amplify real experiences with guided ones, often “immersive” in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion. The American Homeland Security Exercise and Evaluation Program (HSEEP) provides a set of guiding principles for exercise programs, as well as a common approach to exercise program management, design and development, conduct, evaluation, and improvement planning. It offers an approach by which there are 7 types of exercises, each of which is either discussion-based (4 types) or operations-based (3 types). Discussion-based exercises, which are of interest to this project as they are more practical in a classroom setting, familiarize participants with existing plans, policies, agreements and procedures, and include: Seminars - an informal discussion, designed to orient participants to new or updated plans, policies, or procedures Workshops - employed to build specific products, such as a draft plan or policy, and Tabletop Exercise (TTX)- which involve key personnel discussing simulated scenarios in an informal setting. Additionally, there are Games- a simulation of operations that often involves two or more teams, usually in a competitive environment, using rules, data, and procedure designed to depict an actual or assumed real-life situation. The tabletop simulation is an educational tool intended to provide students/learners an opportunity to apply knowledge about preparedness and potential disaster situations through formal discussion of a described scenario. Table-tops are useful and effective teaching tools when hands-on training may be impractical or impossible to conduct. They are designed to stay in the classroom, making the session more manageable, even with a large number of participants. Other researchers suggest that simulation scenarios must include a context of hazard, vulnerability and risk. Participants are assigned roles, and are discussing the progress as it happens under time constraints. A crucial element must be a well-defined set of objectives to be reached. Tabletop simulations are best performed when they are relating to the overall aspects and dimensions of the real situation such as responding to systems failures, human reactions, media demands, leadership issues, vertical and horizontal management and interfaces. Evaluation of the significance of TTX in training is commonly associated with military, aviation, and in medical emergency training as was one by Whitney Et al (2016) in a study that evaluated residents’ confidence and attitudes related to management of earthquake victims during a tabletop simulation and 6 months after the intervention. The paper concludes that Tabletop simulation can improve resident comfort level with rare events. Tabletop can also be easily integrated into resident curriculum and may be an effective way to provide disaster medical response training for trainees. Cicero,(210) in a different scenario

The research leading to these results has received funding from Horizon 2020, the European Union’s Framework Programme for Research and Innovation (H2020/2014-2020) under grant agreement n° 653289.
concludes that improvement was maintained five months after the educational simulation intervention took place. An alternative is to include the D-TORC training to experiment on flexibility and resilience management. The student would be able to choose her-his appropriate approach for integrating the knowledge was achieved in the course.

Learning outcomes:
Central aspects of the training (in conjunction with DARWIN’s perspective) include:

1. To be exposed to realistic real-time conditions of resilience management.
2. To exercise skills acquired throughout the course.
3. To integrate the various modules materials into a cohesive discipline.
4. To experiment working guiding SOPs.
5. To experiment the tension between plan and adaptability.

Evaluation of the understanding and implementation capacity of the materials will be through Modules six or seven. Advantages and limitations from the proposed academic course

The academic course proposed above is based on validated scientific knowledge and the wide experience of senior content experts. The course presents resilient management as a process that engages governance, organizations, populations and the interfaces between them. While this broad availability of knowledge is a great advantage, it also constitutes a certain limitation in the fact that it is not explicitly directed towards one target audience. Another advantage of the course development was that it served to create mini-presentations on specific topics as requested by DARWIN project members and managers.

4.2.5 DARWIN academic course conclusions and next steps

The academic course proposed in this deliverable took the DARWIN view of the resilient management process and turned it into an available format for academic lecturers. The course structure was influenced by the results of former stages of the Darwin project, especially the concept map of the DRMG.

This course will now be disseminated and recommended to internationally acclaim through conference presentations (e.g. IPRED V conference that will take place at 2018), in the DARWIN project website and further publications. Thus, in order to provide state of the art of academic and hands on practical knowledge to relevant audience from academic institutions, governmental authorities, and private sector organizations and institutions.

4.3 Training material as integrated part of Industry and Master courses

Since the beginning of the DARWIN project, there has been an opportunity to use material generated during the systematic literature review (DARWIN D1.1) as part of lectures both at Linköping University (2016) and at the Norwegian University of Science and Technology (2016 and 2017).

4.3.1 Resilience Engineering course at Linköping university

This course describes a DARWIN lecture as part of two days Industry – University course.

Course title: Resilience Engineering: why, what and how and the art of connecting theory to practice

Aim of the course, take away and form: More than ten years has passed since the introduction of Resilience Engineering (RE), the term resilience has become extremely popular (Woods 2015). This course provided participants a better understanding of the big picture of RE concepts and current methods,
D3.4 Resilience Management Concepts and Application Tutorials

concepts and practices so they can start finding ways to develop further and to apply these concepts, practices, and tools in their work. Specific stories, practical examples, and resilience topics were presented to the participants.

Example of stories:

- Everyday successful operations to investigate how complex socio-technical systems work, to achieve a better understanding the operational capability in terms of abilities to monitor, anticipate, respond (including readiness to respond) and learn;

- Extreme situations such as natural or man-made disasters where demands increase to explore hidden interdependencies, cascade effects and the ability to sustain operations and its capacity of maneuver;

Resilience engineering basic concepts and methods were presented as a baseline for discovery. It included, amongst others, resilience abilities, adaptive capacity, fundamentals of resilience engineering, leading indicators, early warnings, weak signals, managing trade-offs (e.g. efficiency-thoroughness, flexibility-stiffness); cross-scale interactions (how systems/organizations can be well adapted locally, but maladapted globally). Based on work produced by Resilience Engineering scientists and practitioners. Extreme situations and crisis management was based on DARWIN material.

The course was highly participatory using innovation games (Gray et al., 2010). Innovation game concept mapping was used by participants to map resilience concepts to specific crisis within their domains (template provided in Appendix B2). Power point presentations were kept to a minimum. At the course, the participants explored and discover resilience topics related to different degrees of performance using specific practical examples. The task aimed to investigate and discover ways to enhance resilience. This was a joint activity between practitioners from the industry and academia.

Figure 4-4: Concept card mapping – crisis and everyday situations related to resilience concepts
D3.4 Resilience Management Concepts and Application Tutorials

Participants of the Linköping course were both practitioners and academia. Example of practitioners included representatives from railway, transport accident investigation board, aircraft manufactures and firefighters.

**Lessons learned:** Some discussions were performed in Scandinavian language as participants were more comfortable to share experiences. Participants were actively involved in the presentation of different examples from their respective domains mapping resilience concepts related to crisis management. Thus, concepts identified in the literature review are relevant to these domains. Participants were interested on how the concepts could be implemented in their own organizations.

### 4.3.2 Resilience Engineering at Norwegian University of Science and Technology

Resilience Engineering are included in Master lectures lectures at NTNU. The safety management course includes lecture on resilience engineering and benefits from DARWIN D1.1 content. More information at: https://www.ntnu.edu/studies/courses/TI04200#tab=omEmnet.

In 2016 the course “Risk governance, societal safety and emergency preparedness” and safety management included DARWIN resilience concepts. For 2017, this course is named “Societal safety and critical infrastructure”, this course will contain resilience concepts as well as cyber-related risks, more information at: http://www.ntnu.edu/studies/courses/TI04201#tab=omEmnet. The 2017 course included two lectures based on DARWIN material. The topic for the first lecture was deficits on risk management (Renn, 2008). This lecture used DARWIN scenarios and DARWIN template for innovation game concept mapping (Appendix B2).

Attendance: about 60 MSc students for Safety Management, and 20 for Risk governance, 20 societal safety and critical infrastructure, 40 students for safety management

Place and date autumn 2016, Norwegian University of Science and Technology, NTNU; New course took place Autumn 2017

### 4.3.3 Advantages and limitations from the proposed lectures

For the project, it is an opportunity to disseminate resilience management to new generation of professionals. Thus, at the end of their education their tools associated to crisis management include resilience aspects.

The illustrations and connection with real case studies and events are appreciated.

The combination of innovation games was appreciated as it gives room for reflection and own interpretation of resilience management concepts (examples provided in appendix B1 and B2).

The students indicated that the proposed material includes a wide range of concepts (too much text in some slides). There was a difficulty to determine which of the presented concepts are the most important ones.

### 4.3.4 DARWIN specific lectures conclusions and next steps

In terms of training, the specific lectures show that is possible to adapt DARWIN results for different stakeholders (industry or students). We build lectures based on deliverables from WP1, WP2 and WP4. WP1 provides overview of resilience concepts and it can be used a source of knowledge for a theoretical introduction. WP2 advances on relating the resilience concepts to practical interventions. Thus, we can introduce how resilience can be enhances. WP4 is source of scenarios where resilience concepts and interventions can be related to during lectures.
Next steps include the update lectures considering students input. Simplifying the content to indicate specific aspects for each resilience concept. Prepare a short introductory video to resilience management as introduction to the lecture.

5 Discussion - Comparing training approaches

This deliverable presented several different approaches of tutorials for resilience concepts described in the guidelines developed in T2.1. Each tutorial was developed by the DARWIN partners respectively, expressing the expertise and experience of each partner and insights from their brainstorming and review sessions and processes. The training materials served both internal and external needs.

As such, there are three main uses for these training materials:

- Usage of the training material during the DARWIN pilot case(s) and at other places inside DARWIN
- Usage of the training materials such as the Webinar for internal training
- Usage of training material outside the project

Differences between methods: The WIKI, D-TOR. DCoP presentations and engineering course are based on CCs and scenarios developed during the first phases of the project. However, an academic course was developed based on the concept map (an output of D2.1), taking a more holistic approach towards the resilient management process. This is an important point as it facilitates, the “connection” of various audiences with variable levels of familiarity with the challenges of disaster management in order to form their skills for the development of adapted resilient management in their environment.

Table 9: DARWIN Typology of training approaches – who and when

<table>
<thead>
<tr>
<th>Training</th>
<th>Description</th>
<th>Resources</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiki Tutorial</td>
<td>Directly available with the guidelines, helps end-users to find information and navigate in the wiki.</td>
<td>No resources outside of the wiki.</td>
<td>Simplifies the inclusion of a tutorial directly with the guidelines. Allows for the use of rich multimedia content.</td>
<td><em>Currently</em>: limited use of rich content and coverage of topics (both will be addressed before the end of the project). Does not replace direct interactions to clarify or complement points.</td>
</tr>
<tr>
<td>CCs training</td>
<td>Available with the Concept Cards, will help users (inside and outside of DARWIN project) to get easy access to the Concept Cards and the content behind each of the CCs</td>
<td>The slides have been prepared by DARWIN partners based on available CCs</td>
<td>The slides will help stakeholders to understand the content and the intention of the Concept Cards and can serve as training material for interested parties</td>
<td>The slides as well as the Concept Cards are still not completely self-explanatory. An experienced user is needed to give the presentation and to give answers to</td>
</tr>
<tr>
<td>Training</td>
<td>Description</td>
<td>Resources</td>
<td>Strengths</td>
<td>Weaknesses</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>D-TORC</td>
<td>The basic training material available, and can be easily modified or extended</td>
<td>Templates for organizational preparation in different modes available, as well as linking to Darwin scenario</td>
<td>Direct association with (portfolio) of CCs, possible to adapt to a variety of managerial vs operational relations, exemplified by reference to a Darwin scenario. Operationalization to CC, scenarios recognized by DCoP. Once investment in preparation is made, the marginal cost/effort will be low</td>
<td>Threshold for starting up may be too high. A need for simpler, &quot;motivating&quot; setups</td>
</tr>
<tr>
<td>Academic course</td>
<td>An academic course taking a holistic view of resilient management. The course reviews various aspects of the resilient management process, focusing on the differences according to the emergency cycle phases.</td>
<td>The course was built on requirements and CCs’ map that were developed in the DARWIN project.</td>
<td>A comprehensive course, perceives resilient management as a holistic process. The course was established on validated knowledge from scientific literature and by content experts from multidisciplinary background.</td>
<td>The course is aimed at a broad audience, with no sensitivity to different types of participants.</td>
</tr>
<tr>
<td>Specific lectures</td>
<td>Targeted to industry and master students. Power point presentations addressing Resilience management why, what and how. Complemented with innovation games.</td>
<td>Slides have been prepared by SINTEF/NTNU. Innovation game templates.</td>
<td>The presentation provides an overall introduction to resilience management and essential resilience concepts covered in the DRMG. Innovation games provide opportunities to participants to reflect, interact with course material in a fun and creative way. During the industrial courses it allowed participants to share knowledge related to resilience concepts and different critical infrastructures.</td>
<td>The slides are too comprehensive Simplification is required and the presentation to be complemented with a handout.</td>
</tr>
</tbody>
</table>

In summary the different training materials developed within DARWIN will serve different needs and target groups. The following list will give an overview on mapping the target audiences as defined in D6.3 “Dissemination, Exploitation and External Collaboration Strategy (update)” (version 3.2 dated 31-Oct-2017) and the respective training material.
### Table 10: Mapping of target groups and training material

<table>
<thead>
<tr>
<th>Training</th>
<th>Target groups</th>
<th>Decision Makers</th>
<th>End-Users</th>
<th>Research and Academy Community</th>
<th>Multipliers / Influencers</th>
<th>Public / Media</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiki Tutorial</td>
<td>The Wiki Tutorial can be assessed by interested</td>
<td>The CC training material is intended to</td>
<td>The CC training material is intended</td>
<td>The CC training material</td>
<td>The CC training material</td>
<td>The CC training</td>
</tr>
<tr>
<td></td>
<td>persons coming from each of the identified target</td>
<td>to be used mainly by end-users to</td>
<td>to be used mainly by end-users to</td>
<td>to be used mainly by end-users</td>
<td>to be used mainly by</td>
<td>material</td>
</tr>
<tr>
<td></td>
<td>audience groups. The tutorials will help the</td>
<td>achieve a better understanding on the</td>
<td>achieve a better understanding on the</td>
<td>achieve a better understanding</td>
<td>end-users to help the</td>
<td>material</td>
</tr>
<tr>
<td></td>
<td>respective persons to get a better understanding</td>
<td>contents of the CCs</td>
<td>contents of the CCs</td>
<td>contents of the CCs</td>
<td>respective persons to</td>
<td>material</td>
</tr>
<tr>
<td></td>
<td>on the contents of the CCs</td>
<td></td>
<td></td>
<td></td>
<td>get a better understanding</td>
<td>material</td>
</tr>
<tr>
<td>CCs training</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>material</td>
</tr>
<tr>
<td>D-TORC</td>
<td>Policy makers, crisis managers</td>
<td>Crisis managers, first responders</td>
<td>Research on effectiveness and</td>
<td>Research on effectiveness and</td>
<td>Research on effectiveness and</td>
<td>Illustrative</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>efficiency of resilience</td>
<td>efficiency of resilience</td>
<td>efficiency of resilience</td>
<td>examples</td>
</tr>
<tr>
<td></td>
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<td>training</td>
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<tr>
<td>Academic course</td>
<td>The training courses can be used for academic</td>
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<td>The training courses can be used for</td>
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<tr>
<td></td>
<td>lectures to explain and train students in</td>
<td>academic lectures to explain and train</td>
<td>academic lectures to explain and train</td>
<td>used for academic lectures</td>
<td>used for academic lectures</td>
<td>courses to explain</td>
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<tr>
<td></td>
<td>different areas on how resilience should be</td>
<td>students in different areas on how</td>
<td>students in different areas on how</td>
<td>explain and train students</td>
<td>explain and train students</td>
<td>and train students</td>
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<tr>
<td></td>
<td>handled in early developments of concepts or</td>
<td>resilience should be handled in early</td>
<td>resilience should be handled in early</td>
<td>explain and train students</td>
<td>explain and train students</td>
<td>and train students</td>
</tr>
<tr>
<td></td>
<td>procedures.</td>
<td>developments of concepts or procedures.</td>
<td>developments of concepts or procedures.</td>
<td></td>
<td></td>
<td>and train students</td>
</tr>
<tr>
<td>Specific lectures</td>
<td>Specific lectures can be adopted to serve the</td>
<td>Specific lectures can be adopted to</td>
<td>Specific lectures can be adopted to</td>
<td>Specific lectures can be</td>
<td>Specific lectures can be</td>
<td>Specific lectures can</td>
</tr>
<tr>
<td></td>
<td>needs for any of the identified target groups</td>
<td>serve the needs for any of the identified</td>
<td>needs for any of the identified target</td>
<td>adopted to serve the needs</td>
<td>adopted to serve the needs</td>
<td>be adopted to serve</td>
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<tr>
<td></td>
<td>separately.</td>
<td>target groups separately.</td>
<td>target groups separately.</td>
<td>separately.</td>
<td>separately.</td>
<td>the needs for any</td>
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<td>of the identified</td>
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<td>target groups</td>
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<td></td>
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<td>separately.</td>
</tr>
</tbody>
</table>
6 Conclusions

The main aim of this deliverable was to document work associated with the development of training modules for resilient crisis management. The training modules are aimed at a broad audience coming from various fields and representing various roles in the process of disaster management. DARWIN, has taken this vast amount of knowledge, available in the academic and practical domains, and managed to create a concept map, translated into practical guidelines, tutorials, gaming tools.

6.1 Main findings

The training material can now be adopted and adapted by various users and organizations to tailor their own resilient management training program, to suit their role, environment and needs. The immediate implication is that end users at any level in operational, governmental or academic status may use one or a number of the training methods.

The applicability to varying end-users and stakeholders is central to achieving the establishment of the DARWIN Community of Practitioners (DCoP) based on the Resilience Management Guidelines (DRMG), which is the main objective and core result of the DARWIN project, and the basis of the concept map.

6.2 Expected impact of training package outside the project

Based on the information noted above, it is suggested that the impact of DRMG will not be confined and limited to identified end users and stakeholders. The presence of academic beyond hands on training opportunities created within DARWIN will create a pool of training material and technology for whoever will be interested and will join DARWIN Community of Practitioners (DCoP). The guidelines may be used by agencies of all levels and all sectors from government to public' private or corporate.

6.3 Limitations of the proposed training package

The scope of researching and innovating in any project is naturally limited. The training material has been used in limited occasions. More training opportunities will contribute to its improvement. One limitation, that also may be also the base for additional future development is the limited use of web based methods, in terms of using social networks as training and learning technology.

6.4 Lessons learned

Resilience is a hyper popular concept in general e.g. our literature review identified 300 definitions associated to resilience (DARWIN D1.3). Consequently, it represents a training and learning challenge as well an opportunity. The scope of the concept and the variability of definitions and approaches may have a crucial effect on resilience management. It is therefore an opportunity for the DARWIN project to present and provide clarification in this area. It is recommended to start any resilience project by setting up not only a common base of knowledge for all users, but also to create a common interdependent network of users where discussions and debates may take place as a base for cross-fertilisation and shared training.

6.5 Next steps

Based on the accomplished results, future attention may be dedicated to use the training material in different opportunities. In addition, updates in the training material can be performed as a consequence of lessons learned after a training session or evolution of the content of the DRMG. Further suggested adaptation could relate to international development such as DRR- Disaster Risk Reduction treaties and future initiatives, and to reaching out to a broader spectre of Universities.
7 References


Fema Online Course Catalog https://training.fema.gov/?trk=profile_certification_title

Georgia Tech http://aysps.gsu.edu/pmap/doctor-of-philosophy-public-policy


George Washington University aster level programs (http://scs.georgetown.edu/departments/36/degrees-in-emergency-disaster-management/?utm_source=Google&utm_medium=Search&utm_campaign=FY17_Search_EDM&gclid=Cj0KEQiws5HHRBGq5IK6k938j_IBEIQARZBJWnJPimsOKFjFOxF-76D2tIScrCThM0wnwnkXRplGGcaAn338PBHAQ


D3.4 Resilience Management Concepts and Application Tutorials


International Strategy for Disaster Reduction (2002) ,UN General Assembly (UN General Assembly Resolution 56/195)

NATO (http://www.coemed.hu/coemed/courses/courses/163-nato-emergency-medical-pre-deployment-team-empt-training-)

Perera, I., Meedeniya, D., Banerjee, I., & Choudhury, J. Experts training and exchange, European Civil Protection and Humanitarian Aid Operation, 2013 IEEE International Conference in MOOC, Innovation and Technology in Education (MITE)

http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?reload=true&punumber=6747514&filter%3DAND(p_IS_Number%3A6756292)&pageNumber=3


The Community Stress Prevention Centre training (http://www.icspc.org/)


The research leading to these results has received funding from Horizon 2020, the European Union’s Framework Programme for Research and Innovation (H2020/2014-2020) under grant agreement n° 653289.
8 Appendices

A Set of slides: Tutorial on concept cards

Slides enclosed are mainly related to the Initial Generic Resilience Management Guidelines as documented in DARWIN D2.1. For updating the presentations is recommended to refer to the current version of the DRMG as available in the DARWIN Wiki. In the DARWIN Wiki is possible to find additional information e.g. illustrations, interventions, methods. The slides given here are just an example. A PowerPoint version is available on request.
D3.4 Resilience Management Concepts and Application Tutorials

Outline

• Why - challenge?

• What is DARWIN?

• What is resilience?

• Overview of DARWIN Resilience Management Guidelines

• Tutorial on a specific concept card

• Further information

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Challenge: effect of crisis on critical infrastructures and social structures

The driver
Hidden interdependencies

The difficulty
Handling surprises and cascades

Current methods
Linear thinking
Dealing with expected situations

The need
Escaping oversimplifications
Initial work on standards
Mainly theoretical developments

What is DARWIN?

Horizon 2020 project: 2015 - 2018

- Develops guidelines for resilient management
- Evaluates these guidelines
- Guidelines for work, tools, strategies, planning, training and exercises.
- Guidelines for managers (direct users), operative personnel (indirect users)
- DARWIN Community of Crisis and Resilience Practitioners

The research leading to these results has received funding from Horizon 2020, the European Union's Framework Programme for Research and Innovation (H2020/2014-2020) under grant agreement n° 653289.
What is Resilience?

- Multiple definitions, overall
  "A system is resilient if it can adjust its functioning prior to, during, or following events (changes, disturbances, and opportunities), and thereby sustain required operations under both expected and unexpected conditions. (Hollnagel, 2014)"

- Used in multiple fields within DARWIN
  - Resilience Engineering
  - Community resilience

- Resilient systems feature four capabilities:
  - Anticipate
  - Monitor
  - Respond and adapt
  - Learn and evolve

Evolving Resilience Management Guidelines

DARWIN Resilience Management Guidelines (DRMG) are guiding principles to advice CI stakeholders in the creation/assessment/improvement of its own guidelines/procedures/practices.

DRMGs are a combination of concepts cards in developing a critical view on its own crisis management activities (management of resources, procedures, training, etc.) based on resilience management concepts.

The research leading to these results has received funding from Horizon 2020, the European Union’s Framework Programme for Research and Innovation (H2020/2014-2020) under grant agreement n° 653289.
Top ten resilience concepts for crisis management

- Support: coordination and synchronisation of distributed operations
  - Understanding goals and responsibilities
  - Promoting common ground in cross-organizational collaboration
  - Establish networks for promoting inter-organizational collaboration

- Managing adaptive capacity
  - Enhancing the capacity to adapt to both expected and unexpected situations
  - Adaptation relative to procedures

- Assessing resilience
  - Noticing brittleness
  - Identifying sources of resilience
  - Community resilience assessment

DARWIN Resilience Management Guidelines

The guidelines build on the Concept Cards by organising and relating them, because the resilience management capabilities they refer to are not independent.

A knowledge management platform, the DARWIN Wik, facilitates the development, management and future use of the guidelines.

Structured data allow for the generation of multiple formats for different uses, based on the same content.

The research leading to these results has received funding from Horizon 2020, the European Union’s Framework Programme for Research and Innovation (H2020/2014-2020) under grant agreement n° 653289.
### Structure of concept cards

<table>
<thead>
<tr>
<th>Title of the concept</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Introduction</td>
</tr>
<tr>
<td></td>
<td>• Before a crisis</td>
</tr>
<tr>
<td></td>
<td>• During a crisis</td>
</tr>
<tr>
<td></td>
<td>• After a crisis</td>
</tr>
<tr>
<td></td>
<td>{Use of “triggering questions”}</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Understanding context</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Objectives</td>
</tr>
<tr>
<td>• Actors</td>
</tr>
<tr>
<td>• Expected benefits</td>
</tr>
<tr>
<td>• Relation to risk management</td>
</tr>
<tr>
<td>• Illustrations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relevant Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Practices, Methods &amp; Tools</td>
</tr>
<tr>
<td>• Further reading</td>
</tr>
</tbody>
</table>

### Top ten resilience concepts for crisis management

- **Support**: coordination and synchronisation of distributed operations
  - Understanding goals and responsibilities
    - Promoting common ground in cross-organizational collaboration
    - Establish networks for promoting inter-organizational collaboration
  
  - Managing adaptive capacity
    - Enhancing the capacity to adapt to both expected and unexpected situations
    - Adaption relative to procedures

- Assessing resilience
  - Noticing brittleness
  - Identifying sources of resilience
  - Community resilience assessment

---

The research leading to these results has received funding from Horizon 2020, the European Union's Framework Programme for Research and Innovation (H2020/2014-2020) under grant agreement n° 653289.
Understanding roles and responsibilities

**Purpose:** Stakeholders need to have sufficient insight into their own responsibilities. This includes knowing what resources, plans, experiences and expertise they have. Furthermore, they need have insight into other actors responsibilities. This is vital in order to identify gaps and cooperate before, during and after a crisis so effective action is taken.

*What is needed to understand:*
- Who needs to be contacted during a crisis
- Which are the relevant roles for the management of specific crises
- What should be expected from other organizations during a crisis.

*Expected benefits:*
- A more effective mitigation of the effects of the crisis
- A quicker return to a stable state

*Extract available in the Wiki-handouts that can be used by facilitators*
Understanding roles and responsibilities – Triggering questions

<table>
<thead>
<tr>
<th>Related to</th>
<th>Before</th>
<th>During</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>Involvement of organizations</td>
<td>X</td>
<td>n/a</td>
<td>X</td>
</tr>
<tr>
<td>Coordination mechanism</td>
<td>X</td>
<td>n/a</td>
<td>X</td>
</tr>
<tr>
<td>Impact on other organizations</td>
<td>X</td>
<td>n/a</td>
<td>X</td>
</tr>
<tr>
<td>Internal dissemination of changes</td>
<td>X</td>
<td>n/a</td>
<td>X</td>
</tr>
</tbody>
</table>

Understanding goals and responsibilities

- Before a crisis: Examine
  - Can we develop a Quick Reference Guide?
  - Which organisations are involved?
  - Need additional organisation to be involved?
  - Who's responsible for what?
  - Were there changes in our org that we need to communicate?
D3.4 Resilience Management Concepts and Application Tutorials

**Understanding goals and responsibilities**

- During a crisis: Act / Cooperate / Improvise

  - Use Quick Reference Guide
  - Act according to your training
  - Know your (and other’s) responsibilities

- Crisis

**Understanding goals and responsibilities**

- After a crisis: After action review

  - Did our shared procedures involved all organizations?
  - Was our training effective concerning changes?
  - Was the Quick Reference Guide used?
  - Were all relevant organisations involved?
  - Is the frequency of periodic coordination sufficient?
Further information

- DARWIN Wiki:
  
  http://sintef9013.com/darwin_wiki/
  
  - Login: DCOPguest
  - Password: darwin

- DARWIN Community of Crisis and resilience Practitioners & DARWIN Homepage:
  
  https://h2020darwin.eu/

- The DARWIN Wiki will be transfer to the DARWIN homepage

And remember:

“After the crisis is before the crisis!”
B Innovation games adapted for lectures

Different games are used during lectures to have interaction with participants ensure understanding on risk management or resilience concepts, and practices presented during lectures. Here we include the games that were easy to understand. Participants remarked its added value in terms of understanding resilience concepts.

B.1 Kahoot

Kahoot is a free game learning platform (www.kahoot.com). We use kahoot to support learning and trace what has been understood by participants. At the end of a session we use this game as debriefing on essential resilience concepts discussed during the lecture. The following kahoots have been created:

- DARWIN resilience concepts and practices relevant for crisis management
- DARWIN DCoP 2017 Workshop Resilience contribution to crisis management

Outcome from DCoP audience and NTNU students: The game is appreciated as it facilitates interactions and discussions. It is good as a summary on important aspects discussed during the lesson.

B.2 Concept mapping

Concept mapping or affinity map as innovation game has been used during Resilience Workshop at Linköping in 2016 and during lectures at NTNU.

Outcome from audience: Easy to understand, it was a surprise that it was easy to relate several concepts to specific experiences and events

B.2.1 Essentials for innovation game: Affinity Map

“The value of the Affinity Diagram game increases when two conditions are met. The first is that the players generate multiple data points, ideally with good information. The second relates to the quality of the sorting. The cleaner the players’ insights when they form relationships within the content, the better the categories will be. The affinity diagram was devised by Jiro Kawakita in the 1960s. It is also referred to as the KJ Method.

Object of the play

Most of us are familiar with brainstorming—a method by which a group generates as many ideas around a topic as possible in a limited amount of time. Brainstorming works to get a high quantity of information on the table. But it begs the follow-up question of how to gather meaning from all the data. Using a simple Affinity Diagram technique can help us discover embedded patterns (and sometimes break old patterns) of thinking by sorting and clustering language-based information into relationships. It can also give us a sense of where most people’s thinking is focused. Use an affinity diagram when you want to find categories and meta-categories within a cluster of ideas and when you want to see which ideas are most common within the group.

Ingredients

Players Up to 20
Facilitator 1
Duration Maximum 1.5 hours

Preparation
D3.4 Resilience Management Concepts and Application Tutorials

1. On a sheet of flip-chart paper, write a question the players will respond to along with a visual that complements it. Conduct this game only when you have a question for the players that you know will generate at least 20 pieces of information to sort.

2. Ask each player to take 10 minutes to generate sticky notes in response to the question. Use index cards on a table if you have a group of four or less. Conduct this part of the process silently.

3. Collect the ideas from the group and post them on a flat working surface visible to everyone. It should end up resembling the following figure.

![Affinity Map](image)

4. Based on guidance from the players, sort the ideas into columns (or clusters) based on relationships. Involve the group in the process as much as possible. Have the players approach the wall to post their notes—it saves time—and allow them to do an initial, general sorting in columns or clusters.

5. Create a sticky-note “parking lot” close to the display for ideas that don’t appear to fall into a natural category. Redundancy in ideas is OK; don’t discard sticky notes because they’re already represented. It’s helpful to leave repeated ideas posted since it indicates to the group how many people are thinking the same thing. At this stage, ask the players to try to avoid searching for higher categories and simply to focus on grouping the information based on the affinities.

6. Once the content is sorted, ask the group to suggest categories that represent the columns you’ve created and write the categories they agree on at the top of the column (or near a cluster if you chose a cluster rather than a column display). Don’t let the players spend an inordinate amount of time agreeing on a name for a category. If there’s disagreement over “Facilities” versus “Infrastructure,” write them both. If the players produce categories that are significantly different, pay attention to which category gets the most approval from the group and write that one. Your visual may end up looking like the one below.


B.3 DARWIN scenarios used during lectures

B.3.1 Scenario: Hurricane Sandy and Thanksgiving holiday
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“This challenge is a combination of an extreme weather event such as Hurricane Sandy and regular event such as high transportation demand during Thanksgiving holiday. Sandy emerged from a topical depression in the Caribbean Sea, was designated a Category 1 hurricane on October 24, 2012, and came ashore in New Jersey as a post-tropical nor’easter on October 29. It was widely considered a “superstorm” because its power increased as the result of an unusual confluence of weather effects, including a high-pressure cold front, which moved in from the north. The storm dissipated as it moved through Pennsylvania, and the National Weather Service (NWS) issued its last Sandy-related weather advisory on October 31 (Drye, 2012).

Sandy devastated the coastal areas of New York and New Jersey, killing more than 100 people, and leaving tens of thousands of people homeless and more than eight million homes without power (“Hurricane Sandy,” 2012). Having caused nearly $50 billion in damage, it was the second-costliest cyclone to hit the US since 1900 (not adjusting for inflation) (Blake, Kimberlain, Berg, Cangialosi, & Beven, 2013).

Challenges associated to the ability to respond: For the states and communities in the path of hurricane Sandy, responding to it was an enormous challenge given its destructive power and large spatial scale. Because the storm moved slowly, it created a need for disaster response while impeding the ability of responders to conduct their life- and property-saving work, a complication not found with fast-moving severe weather patterns.

Managing trade-offs – anticipatory actions: Although a weather impact zone (WIZ) was not yet in force, managers began to plan for actions to include: removal of some vehicles from the zone and the need to shelter those that would remain; the deferral of some vehicle maintenance; the scheduling of travel for transient personnel so as not “trap” them in the zone; and the excusal from duty of personnel residing in the zone.

Adaptation successes: Recognizing the saturation of computer communications, many Operation Center (OC) group members conducted their most important business by phone or face-to-face.” *

![Figure satellite image of hurricane Sandy on October 29 (NASA, 2012).](image)

* Adapted from Deary, D.S. (2015) Dissertation Sources of Organizational Resilience: Sustaining Production and Safety in a Transportation Firm. Ohio State University. This dissertation includes all references

**B.3.2 Scenario: Fukushima accident**

“The first author was the Plant Manager of Fukushima Daiichi NPP Units-5/6 at the time of the Great East Japan Earthquake and was put in a position where he had to cope with the accident in a way that would ensure the safety of site personnel while providing a response to the site emergency.
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When the power plant lost power, lighting, communications, instrumentation and monitoring functions became severely impaired. These conditions combined with exploding buildings and spiking radiation levels plunged the power station into a situation that far exceeded plant design basis.

Just maintaining the status quo required multiple tasks, including supplying fuel to fire engines and power trucks used to cool the reactors, which had to be carried out under extremely challenging conditions with limited resources.

In addition, as various manuals with which plant operators had boasted compliance were being rendered useless, the author was put under enormous pressure to respond quickly and flexibly to the situation based on uncertain information.

It is clear that under such severe accident conditions the situation would have most certainly escalated to catastrophic proportions had it not been for the actions taken at the site. None of the critical actions taken at the site, including injecting water into the reactors, were done automatically—they were the sole response of the people at the plant”


B.3.3 Scenario: Aircraft crashing in urban area close to Rome Fiumicino Airport shortly after taking off

“It is 12:00 am o’clock in Fiumicino, sunny summer day, in Fiumicino Airport, midday is the peak hour for departures (55 movements per hour). An aircraft carries approximately 180 passengers, two pilots and 5 flight attendants. During take-off, a Foreign Object Debris is sucked into the left engine causing serious damages. The engine explodes making the pilot unable to fly the aircraft. The aircraft crashes on an urban area, (highlighted with a red icon in the figure below). Streets and buildings in the area of the accident are damaged. The debris is spread all over the area.

It is evident since the beginning that there will be several injured and dead people (both passengers/crew and people on the ground). Search and rescue services encounter some problems to reach the area due to traffic and unavailability of some streets, which have been closed for two weeks for maintenance work. In order to manage the consequences of the accident, Fiumicino Control Tower activates an alarm system - all the concerned actors. In so doing apply the “ADR Manuale rosso” (“Red Manual” of the airports of Rome).

The firefighters of the airports are the first to intervene in the area of the accident and the airport is suddenly closed to traffic as follows: Traffic departing from Fiumicino is stopped immediately; Air Traffic Controllers in the Control Centre encounter increased workload due to coordination tasks, communications with pilots and nearby ATS (Air Transport System) Units to manage the diversion of traffic.

Immediate cascade effects on aviation system regard flight cancellations and delays, implying passengers’ assistance (from both airlines and airport management company). The aircraft manufacturer and the Air Navigation Service Provider will be involved for investigation purposes.

The first hypothesis from media concerns a terrorist attack with ground to air missile or small bomb on-board. It will be refuted a couple of days after the accident, thanks to investigations and analysis of video material.

The activities regarding healthcare domain will be: checking available hospitals and ambulances, organizing a triage and life-saving treatment on site, organize evacuation of the casualties to hospitals and trauma centres for definitive care, ensuring coordination among the rescue teams on site and hospitals (as
expected, a massive quantity of blood for transfusion will be necessary). Also psychological assistance for survivors and relatives is needed.”

Figure Maps of area affected by the accident

D3.4 Resilience Management Concepts and Application Tutorials