

Project information

Project Acronym:	DRIVER+
Project Full Title:	Driving Innovation in Crisis Management for European Resilience
Grant Agreement:	607798
Project Duration:	72 months (May 2014 - April 2020)
Project Technical Coordinator:	TNO
Contact:	coordination@projectdriver.eu

Deliverable information

Deliverable Status:	Final
Deliverable Title:	D934.12 – Method and tool for training decision-making context
Deliverable Nature:	Report (R)
Dissemination Level:	Public (PU)
Due Date:	December 2017 (M44)
Submission Date:	26/01/2018
Sub-Project (SP):	SP93 - Solutions
Work Package (WP):	WP934 – Legacy Solutions
Deliverable Leader:	TNO
Reviewers:	Klaudia, Tani, EOS Pawel, Gromek, SGSP Peter Petiet, TNO
File Name:	DRIVER+_D934.12_Method and tool for training decision-making context.pdf

DISCLAIMER

The opinion stated in this report reflects the opinion of the authors and not the opinion of the European Commission.

All intellectual property rights are owned by the DRIVER+ consortium members and are protected by the applicable laws. Except where otherwise specified, all document contents are: “©DRIVER+ Project - All rights reserved”. Reproduction is not authorised without prior written agreement.

The commercial use of any information contained in this document may require a license from the owner of that information.

All DRIVER+ consortium members are also committed to publish accurate and up to date information and take the greatest care to do so. However, the DRIVER+ consortium members cannot accept liability for any inaccuracies or omissions nor do they accept liability for any direct, indirect, special, consequential or other losses or damages of any kind arising out of the use of this information.

Revision Table

Issue	Date	Comment	Author
V0.1	22/11/2017	Initial draft	Anja van der Hulst, TNO, Charelle Bottenheft, TNO, Dennis Coetsier, TNO, Marcel van Berlo, TNO
V0.2	14/12/2017	Second draft	Anja van der Hulst, TNO, Charelle Bottenheft, TNO, Dennis Coetsier, TNO, Marcel van Berlo, TNO
V0.3	20/12/2018	Peer review	Klaudia Tani, EOS
V0.4	05/01/2018	Adjustments to review comments	Dennis Coetsier, TNO
V0.5	12/01/2018	Peer review	Peter Petiet, PD
V0.6	17/01/2018	Preparation of final reviewed version	Dennis Coetsier, TNO
V0.7	24/01/2018	Final check and approval for submission	Tim Stelkens-Kobsch, Quality Manager, DLR
V0.8	25/01/2018	Final check and approval for submission	Peter Petiet, Project Director, TNO
V1.0	26/01/2018	Submission to the EC	Francisco Gala, TNO

The DRIVER+ project

Current and future challenges due to increasingly severe consequences of natural disasters and terrorist threats require the development and uptake of innovative solutions that are addressing the operational needs of practitioners dealing with Crisis Management. DRIVER+ (Driving Innovation in Crisis Management for European Resilience) is a FP7 Crisis Management demonstration project aiming at improving the way capability development and innovation management is tackled. DRIVER+ has three main objectives:

1. Develop a pan-European Test-bed for Crisis Management capability development:
 - Develop a common guidance methodology and tool (supporting Trials and the gathering of lessons learned).
 - Develop an infrastructure to create relevant environments, for enabling the trialling of new solutions and to explore and share Crisis Management capabilities.
 - Run Trials in order to assess the value of solutions addressing specific needs using guidance and infrastructure.
 - Ensure the sustainability of the pan-European Test-bed.
2. Develop a well-balanced comprehensive Portfolio of Crisis Management Solutions:
 - Facilitate the usage of the Portfolio of Solutions.
 - Ensure the sustainability of the Portfolio of Tools.
3. Facilitate a shared understanding of Crisis Management across Europe:
 - Establish a common background.
 - Cooperate with external partners in joint Trials.
 - Disseminate project results.

In order to achieve these objectives, five sub-projects (SPs) have been established. **SP91 Project Management** is devoted to consortium level project management, and it is also in charge of the alignment of DRIVER+ with external initiatives on crisis management for the benefit of DRIVER+ and its stakeholders. In DRIVER+, all activities related to Societal Impact Assessment (from the former SP8 and SP9) are part of SP91 as well. **SP92 Test-bed** will deliver a guidance methodology and guidance tool supporting the design, conduct and analysis of Trials and will develop a reference implementation of the Test-bed. It will also create the scenario simulation capability to support execution of the Trials. **SP93 Solutions** will deliver the Portfolio of Solutions which is a database driven web site that documents all the available DRIVER+ solutions, as well as solutions from external organisations. Adapting solutions to fit the needs addressed in Trials will be done in SP93. **SP94 Trials** will organize four series of Trials as well as the final demo. **SP95 Impact, Engagement and Sustainability**, is in charge of communication and dissemination, and also addresses issues related to improving sustainability, market aspects of solutions, and standardization.

The DRIVER+ Trials and the Final Demonstration will benefit from the DRIVER+ Test-bed, providing the technological infrastructure, the necessary supporting methodology and adequate support tools to prepare, conduct and evaluate the Trials. All results from the Trials will be stored and made available in the Portfolio of Solutions, being a central platform to present innovative solutions from consortium partners and third parties and to share experiences and best practices with respect to their application. In order to enhance the current European cooperation framework within the Crisis Management domain and to facilitate a shared understanding of Crisis Management across Europe, DRIVER+ will carry out a wide range of activities, whose most important will be to build and structure a dedicated Community of Practice in Crisis Management, thereby connecting and fostering the exchange on lessons learned and best practices between Crisis Management practitioners as well as technological solution providers.

Executive summary

This document reports about the development and testing of a method and tool for Decision-Making Context (DMC) training for high level decision makers (former WP504.2). The work started under the former driver topic evolved learning (WP5) and has been finished in the DRIVER+ programme (SP93 Solutions). A main conclusion in the driver report (WP504.1) is that “for most of the emergency organizations and agencies in Europe, a training process for the strategic level does not exist, or refers only to the logistics of *how to work during an incident*” [1]. Therefore, a dedicated DMC training module for high level commanders was created, which can be used to prepare strategic decision-makers for the trials planned (SP94) in DRIVER+. To create this training the following steps have been taken:

1. Identifying the training needs of high-level decision-makers in crisis situation with regards to the crisis management process and context. In all, we got to the following primary needs:
 - a) Building situational awareness, based on various perspectives of the staff available.
 - b) Handling strategic dilemmas in crisis-management, and in that those dilemmas should arise under challenging conditions and should have high stakes.
 - c) Handling double bind situations with advisors providing conflicting advice.
 - d) Anticipating on popular acceptance of interventions.

Gaining competency in complex decision-making (CDM) requires a lot of exercise. On the basis of earlier evaluation studies on the value of the larger life crisis management exercises, it was stated that such exercises in generally fail to offer true exercise in strategic decision-making. To improve the training value, it was argued that strategic decision-making has to be trained both extensively and separately before it is integrated in larger crisis management exercises.

2. Creating a demonstrator for a training program for DMC training: To fulfil the training needs mentioned above a demonstrator for a part task training has been developed. As a demonstrator for a part task training program for DMC training, the DRIVER+ CM Flooding game was developed based on an engine for dilemma gaming. The embedding in the curriculum was defined, based on the principles of the educational approach Job Oriented Training.
3. Testing the effectiveness and usability of the developed DMC training in different countries: The demonstrator was tested in several rounds and validated with participants from different countries. This led to the following conclusions.

With regard to the content of the demonstrator game, from the participant’s assessments we can conclude that the dilemmas are at the right level (strategic) and that the overall scenario and the dilemmas are sufficiently realistic and challenging. The feedback, however, needs work to make it more adequate. Only 60% of the participant found the feedback (the newspaper article) sufficiently realistic. To the question whether the training would fit the crisis management system of the participating countries there is no conclusive answer, so this aspect requires further scrutiny.

Interestingly, the training did affect the participants emotionally. The predominant emotions that were reported by the participants are on the anger (anger, frustration) axis and on the fear (fear, worried, concern, feels insufficient, anxiety) axis. We aimed to invoke such emotions and in a future study, one would have to investigate whether training that invokes realistic emotions will have positive transfer and thus help handling emotions better in a real crisis situation.

Finally, with regard to meeting the training needs; the participants were asked: “Assuming that crisis managers would be trained with a series of at least five of these game based scenario’s, to which extent would this training improve CDM in actual crisis situations?”. The participants were fairly positive in their answers, with most indications between moderate and extremely good. Evidently, this is a subjective judgement, so the value of this is limited, but it suggests that the development of the current module may be on the right track. Also, all participants were positive about the idea to provide part task decision-making training for high level commanders separate from crisis-management exercises.

Table of Content

The DRIVER+ project.....	4
Executive summary	5
1. Introduction	10
1.1 Aim	10
1.2 Context.....	10
1.3 The training programme	10
2. Training Objectives.....	12
2.1 Crisis management decision-making	12
2.2 Limitations of strategic level CM decision-making training.....	12
2.3 Dilemmas in Crisis Management.....	13
2.4 Situational awareness	14
2.5 Anticipating popular acceptance of interventions.....	14
2.6 Psychological effects of decision-making with high stakes.....	15
2.7 Summary	15
3. Method: educational approach.....	16
3.1 Selection of the method.....	16
3.2 Experiential learning	17
3.2.1 Practice precedes theory.....	17
3.2.2 Reflective	17
3.2.3 Short cyclic.....	17
3.2.4 Progressively increase in complexity.....	17
3.2.5 Challenging	18
3.2.6 Part task training	18
3.3 Educational approach requirements.....	18
3.4 Training setting	18
3.5 Tooling.....	19
4. Tool: the DRIVER+ CM Flooding game	20
4.1 Demonstrator for flooding disaster	20
4.2 Dilemma gaming	20
4.3 Embedding in the curriculum.....	20
4.3.1 Curriculum	20
4.3.2 Reflection.....	21
4.4 Link	21
4.5 The DRIVER+ CM Flooding game.....	22
4.5.1 Briefing	22
4.5.2 The dilemmas	23
4.5.3 Information elements.....	24
4.5.4 Anticipating on popular appreciation of interventions.....	25
4.5.5 Feedback on the decisions	26

4.5.6	Feedback on style	26
5.	Testing	27
5.1	Test 1	27
5.1.1	Outcomes	27
5.2	Test 2	27
5.2.1	Outcomes	27
5.3	Developing a demonstrator	28
5.4	Validation	28
5.4.1	Test group	28
5.4.2	Test approach	29
6.	Results	30
6.1	Results from the logs	30
6.1.1	Validity of the dilemmas	30
6.1.2	Duration	31
6.1.3	Style	31
6.1.4	Information sources	31
6.1.5	Empathy indications	32
7.	Conclusions	34
7.1	Meeting the learning goals	34
7.2	Content of the game	34
7.2.1	Overall scenario and dilemma's	34
7.2.2	Information sources	35
7.2.3	Feedback	35
7.3	Process	35
7.3.1	Agency	35
7.3.2	Emotions	35
7.4	Educational approach	36
7.4.1	International context	36
7.4.2	Tooling	36
	References	37
	Annexes	39
	Annex 1 – DRIVER+ Terminology	39
	Annex 2 – Scenario	41
	Annex 3 – Questionnaire results	47
	Questionnaire set-up	47
	Answers to questionnaire	48

List of Figures

Figure 2.1: Multidisciplinary CBRN command exercise (Photo: TNO, with consent).....	12
Figure 4.1: Introduction to the setting	22
Figure 4.2: Situational map	22
Figure 4.3: Dilemma screen.....	23
Figure 4.4: The advices, in this case the advice of the technical advisor.	25
Figure 4.5: Empathy indication.....	25
Figure 4.6: Feedback by means of a Journal article.	26
Figure 4.7: Style indication	26
Figure 6.1: Mean duration in seconds.....	31
Figure 7.1: Wheel of emotions [31].....	36

List of Tables

Table 6.1: Answers to the dilemmas	30
Table 6.2: Personal style.....	31
Table 6.3: Use of information sources	32
Table 6.4: Indications of usefulness of advisors.....	32
Table 6.5: Collection of answers regarding empathy.....	32
Table 6.6: Empathy indications	33
Table A1: DRIVER+ Terminology.....	39

List of Acronyms

Acronym	Definition
CD&E	Concept development & Evaluation
CDM	Complex Decision-Making
CM	Crisis Management
DMC	Decision-Making Context
DST	Decision Skills Training
JE	Joint Experiment
JOT	Job Oriented Training
NDM	Naturalistic Decision-Making
SA	Situational Awareness
SIA	Societal Impact Assessment
SP	Sub-Project
UI	User Interface
WP	Work Package

1. Introduction

1.1 Aim

This document reports about the former DRIVER Task 540.2: the development and testing of DMC training for high level decision-makers in the context of the DRIVER programme.

As stated in the report of DRIVER Task 540.1 “as came up from data being collected in literature reviews and from meetings, interviews and workshops, for most of the emergency organizations and agencies in Europe, a training process for the strategic level does not exist, or refers only to the logistics of *how to work during an incident*” [1]. Therefore, it was decided to create a dedicated Decision-Making Context (DMC) module for high level commanders. This DMC training can be used to prepare strategic decision-makers for the Trials planned (SP94) in DRIVER+. Consequently, it must be well suited to prepare the high-level decision-makers before actually engaging in the Trials. Therefore, the objectives of this work are

1. Identify the training needs of high-level decision-makers in crisis situation with regards to the crisis management process and context.
2. Identify an educational approach suitable for the training of strategic decision-making.
3. Create a demonstrator for a training program for DMC training.
4. Assess the validity of the demonstrator for use in different countries.

Based on the Updated Gaps Assessment workshop (SP92) of DRIVER+, the definition of the research questions to be addressed within each Trial, and the solution selection review process (SP94) the final decision on incorporating this DMC training in preparation of the Trials will be made.

1.2 Context

One of the main objectives of DRIVER+ is to *improve the capability development in Crisis Management (CM) and in that, the identification of promising solutions*. The major objectives of former WP540 “High-level decision-making” have been [1]:

T540.1:

- Design an overall training programme for high level decision-makers.
- Validate the compatibility of ‘Effective Command’ to be used within the planned training programme.
- Validate the building blocks identified for the training programmes.
- Further develop the training programme for high level decision-makers.

T540.2:

- Further develop the DMC training for high level decision-makers.
- Software implementation of DMC training.
- Pilot of DMC training.

In T540.1 a DRIVER high level decision-making training programme has been defined. This document reports the efforts in T540.2 aimed at the actual development and testing of the DMC training. As mentioned above, this work will feed into the research questions definition within the Trials.

1.3 The training programme

The training programme as defined in T540.1 contains seven modules, as outlined in [1]:

1. The legal Crisis management (CM) framework and the system.
2. Professional aspects.
3. Understanding the threats that may affect specific countries.
4. Decision-making module.

5. Media and public behaviour.
6. Cross border cooperation.
7. Institutional learning.

The core of this training programme is the decision-making module. Within this module, Task 540.2 aimed at developing a method and tool for the actual decision-making context training and testing and validating it.

As stated in the T540.1 report [1]; *The goal of this module is to ensure that the decision-maker is familiar with the CM model used in her / his country, and is capable of implementing it, understanding the priorities set by the elected level, identifying the information needed and its sources.* It should be noted that member states differ in the methods used to reach this decision: is it by consensus or is it a decision to be taken by an agency with legal power (after a consultation or not) [1].

In the next section, we will start with describing the training objectives for DMC training.

2. Training Objectives

2.1 Crisis management decision-making

Due to the unique nature of each incident, crisis management is highly situational, cognitively complex and performed under highly demanding circumstances. As such, it is typically a form of ‘complex decision-making’ (CDM), usually performed in a multi actor setting [2] (example in Figure 2.1). That is, decision-making under circumstances that can be characterized by ‘dynamic and continually changing conditions, uncertainty and ambiguity, ill-defined tasks, time constraints and most important, high stakes, multiple actors and significant personal consequences of mistakes’ [3].

Substantial part of failure in both disaster or crisis management as well as military operations results from inadequate (shared) situational awareness and decision-making [4]. Building a shared situational awareness in civil command is complicated by the multidisciplinary nature of the services involved, that is, the various services have different responsibilities, different means and different information needs and may have a different perception of priorities. Also, the higher the level of command, the more political considerations play a role as strategic decision-making in essence is about reconciling divergent interests.

All strategic decisions are, by definition, significant, ‘as they are critical for an organizational survival and/or may carry major implications for the distribution of resources’ [32]. As Child et al. [32], states ‘the significance of strategic decision-making means that there is more at stake for those who stand to gain or lose from the decisions in terms of material or reputational consequences.’



Figure 2.1: Multidisciplinary CBRN command exercise (Photo: TNO, with consent)

2.2 Limitations of strategic level CM decision-making training

In DRIVER T540.1, a review was done in several CM organizations on the availability of a training programme for the high-level decision-makers for crisis situations, for most of the organizations reviewed it was concluded in that study ‘we could not find a training programme for the high-level decision-makers. Existing training programmes for high level decision-makers focus on only a few of the subjects the DRIVER training programme addresses, and to be more specific, do not address the decision-making thinking processes’ [1].

Currently, the only training opportunities for CM decision-making are large scale exercises. The value of such large scale exercises appears to be very limited for strategic decision-making. Helsloot [11] reviewed a number of large scale multi-disciplinary operational exercises that were held in the Netherlands. What is striking is that the evaluations of those exercises show very similar results; little is learned with regard to CM policy decision-making and certainly little at the strategic level. In large scale disaster-management exercises, as Helsloot states [11]: ‘police makes sure that bystanders cannot get in the way, firefighters fight virtual fires and paramedics treat victims’. In other words, in the early stages of disaster, the services do what they normally do’. The crisis management in this stage is mainly the coordination between services, which is basically done the tactical level.

The evaluation of the large scale exercise Bonfire [16], for example, makes clear that this exercise did not lead to any strategic decision-making. It was observed that policy decision-makers were predominantly occupied with coordination, internal information supply and crisis communication. This may have caused such a workload for the high-level decision-makers that they failed to anticipate on longer term consequences of the crisis and hence did not engage in strategic decision-making [16].

In [16] Helsloot, concludes that much of the value of those exercises lies in the preparation, but that such large scale exercises add little in the sense of policy decision-making. Looking at the underlying causes of the lack of decision-making, it can be observed that at present, CM exercises usually *'focus on procedures and understanding the roles and responsibilities of the member of the command-team'* [11].

It is also fairly common that crisis management exercises generally deal with the first hours during a crisis [5]. In that phase, the contribution to the actual training of strategic decision-makers is very limited. Boin postulates that in the first hours of a crisis, strategic commanders *'cannot do all that much to provide immediate relief on the ground after a disaster or catastrophe'* [12] Their role is mainly in the long-term recovery and reconstruction of the affected region. Hence, traditional CM exercises are not geared towards training for the strategic dilemmas that typically present themselves later on during a crisis and besides, which are (mostly) not directly related to the operational activities of first responders.

In conclusion, in regular large scale exercises, the opportunities for training at the strategic level, with the typical dilemmas that high level commanders face during a crisis, are very limited [10].

The military has long acknowledged that it requires very different ways of training for each level of command, see e.g. [15]. For the lowest levels, they employ so called *'full dress'* exercises where all personnel is present and in action. These full dress exercises are played out in real time and are highly similar to the life exercises in CM. The military considers such type of exercise valid only for squad and platoon (about 40 persons) and in some cases for company level (about 120 persons), but certainly not for large scale division level or even the political strategic level. At the highest levels, strategic wargames are done for analysis and training [33]. Such wargames do focus on the decision-making only, they are done without the presence of the lower level units and they cover a much longer time-span and are therefore time compressed. In the US, the military top spends about 30% of their time daily¹ on wargaming, hence, they engage extensively in such strategic decision-making training and analysis.

Similar to strategic-decision-making in the military, we argue that strategic decision-making has to be trained both extensively and separately before it is integrated in larger training settings such as crisis management exercises. Dedicated training is needed that specifically focusses upon decision-making, i.e. covering typical strategic dilemmas where priorities have to be set, decisions that include a strong political component.

2.3 Dilemmas in Crisis Management

Strategic decision-making is about mitigating negative (social) impacts of disaster. These impacts can be of various nature. Report D840.11 - Societal Impact Assessment (SIA) [9] has outlined the process of analysing, monitoring and managing intended and unintended social consequences. The most internationally recognised impact assessment methodologies are ECLAC [6] and HAZUS [7]. ECLAC categorises impacts into direct and indirect ones, in addition also divides impacts by social, infrastructure, economic and overall effects. HAZUS mainly focuses on indirect impacts, estimates physical, economic and social sectors excluding, for example, the environmental impact.

Part of the complexity of CM strategic decision-making in CM is in the weighing and thus prioritization of various types of potential disastrous impacts that have to be mitigated. In the early stages of a crisis, one may be focused primarily on reducing the number of direct casualties, but relatively early the impacts on infrastructure, economy and more long term social effects will have to be taken into account. As resources will generally not be unlimited, at the strategic level, the mitigation of impact of a crisis will be about

¹ As stated by vice chairman of the joint chiefs of staff General Paul Selva at the briefing of the Military Operational Research Society's special meeting on wargaming Alexandria, 17-19/10/2017

prioritizing, that is, e.g. prioritizing which negative economic impacts must be mitigated first, which negative social impacts should be countered first, which infrastructure will have to be rebuilt.

Hence, CM decision-making is largely about tackling dilemmas. Strategic dilemmas are the hardest part of strategic decision-making, those problems encountered that have two or even more options, none of which is unambiguously acceptable or preferable. Typical dilemmas could, for example, be weighing the investment in long term economic recovery against providing direct aid to affected families. Or, e.g. deciding upon the prioritisation of the protection of important cultural artefacts at the potential cost of loss of lives.

2.4 Situational awareness

Tackling the strategic dilemma's does require 1) a good Situation Awareness (SA) of the situation as it evolves and 2) a deep insight in the possible impacts of the options available. If planning for potential disasters has been done well, many possible impacts could partly have been worked out in earlier phases. However, gaining grip on the situation as it evolves is one of the hardest parts in crisis management. Building Situational Awareness (SA) during a crisis usually is hard as one has to deal with incomplete, ambiguous and sometime plainly wrong information. Even more challenging than individually obtaining situational awareness is for the decision-makers to attain and maintain an accurate, shared common operating picture and hence reach a shared situational awareness [20]. One of the essential findings of the CDM research is that '(shared) situation assessment' (SA) capabilities are at the heart of the expertise [20].

For strategic level decision-making, there are usually staff members available that will provide technical, media, legal, medical, or e.g. public order expertise. Besides providing information, staff members are likely to provide advice on how to handle the current situation, but they will provide such advice from their very own perspective. A complication is that staff members will provide information that they assume to be relevant, which may not be the whole picture. The strategic decision-maker will have to bring together all these perspectives, search for lacking information and create an overall situational awareness.

SA is the most 'intuitive' aspect of CDM and it takes most time and experience to develop to an expert level [19]. Situation assessment may be essential to CDM, yet in training it is also the most neglected [19]. Particularly, for developing the highly intuitive assessment skills, substantial task experience is indispensable [4]. That is, essential to acquiring a sufficient repertoire of situated patterns, a decision-maker has to experience a vast amount of relevant situations.

In conclusion, a high-level decision-making training will thus have to provide for ample opportunities for building Situational Awareness. That is, be confronted with many different CM situations, being provided with the information staffers would likely be offering in that situation and trying to make sense of it.

2.5 Anticipating popular acceptance of interventions

A complexity in strategic decision-making is the acceptance of interventions to be taken by the population– in terms of possible unease, distrust and negative effects on political reputations [9]. During crisis, leaders need to explain what is going on. They can provide a 'frame' that anchors the thinking and actions of the population. Unease and distrust will make it a lot harder to actually implement measures, even when in itself these measures are advantageous for the population. Also, where political reputations may easily be damaged, decision-makers are likely to be more restraint than desirable for the mitigation of the impacts [12].

In summary, a training for CM decision-making at the strategic level must incorporate:

1. Building situational awareness based on various perspectives of the staff available.
2. Dilemmas in prioritising interventions aimed at the mitigation of the various negative societal impacts- given scarce resources.
3. Anticipation on the popular acceptance of the interventions proposed.

Before working out the educational aims, we will additionally get into the psychological aspects of decision-making at this level as this is relevant to the design for training as well.

2.6 Psychological effects of decision-making with high stakes

Crisis managers have to respond to sudden onset events with potentially catastrophic impact that could disrupt entire communities. The strategic dilemmas here are likely to affect the decision-makers, certainly if none of the options available is without negative consequences. Emotions interrupt our thoughts [20] and in general do have consequences for decision-making. Emotions effect individual performance and are tied to individual's tendencies to engage in action, see the work of Frijda [13]. Yerkes-Dodeson law [14], for example, postulates that high negative arousal can degrade performance². Crisis-situations are expected to invoke high levels of stress, on top of that is a second aspect that might impact the performance of crisis managers, that of a *double bind*. In double bind situations all the options have negative consequences, the typical situation where *'you're damned if you do, you're damned if you don't'*.

Usually, high level commanders have a team of advisers, e.g. for legal, media, technical, public order issues. Yet all of these will provide advice from their very own perspective and hence the crisis manager responsible will have to handle conflicting advice. Consequently, they frequently face 'double bind' situations, emotionally distressing dilemmas in which the crisis manager receives two or more conflicting advices and one advice negates the other. This creates a situation in which a successful response to one advice results in a failed response to the other (and vice versa), so that the person will automatically be wrong regardless of response. This again may generate stress.

Thus, the training we aim at should be geared towards the hardest part of decision-making and thus train for handling strategic dilemmas that may have large societal impact and due to the nature of the decisions to be made may affect the decision-maker emotionally.

2.7 Summary

Given the focal points described above, the high-level decision-making training will need to focus on the following training objectives:

Primary Objectives

1. Building situational awareness, amongst other things based on various perspectives of the staff available.
2. Handling strategic dilemmas in crisis-management, and in that those dilemmas should arise under challenging conditions and should have high stakes.
3. Handling double bind situations with advisors providing conflicting advice.
4. Anticipating on popular acceptance of interventions.

Circumstances

Strategic decision-making in crisis management situations should be done:

- With ambiguous, incomplete or sometimes wrong information.
- With information from different perspectives (legal, technical, medical etc).
- Under time pressure.
- With high risk.
- In situations that might invoke negative emotions.

² Izard, Kagen, and Zajonc [14] note that negative emotions peak at lower levels of arousal (than positive emotions) and hence have more of an effect on performance. They also note that negative emotions can decrease the speed and accuracy of learning (whereas positive states can enhance learning), and retard cognitive and motor abilities. In other words, emotions affect individual performance, and negative emotions such as those that are likely to emerge in crisis situations affect performance negatively.

3. Method: educational approach

3.1 Selection of the method

As stated in the previous sections, gaining competency in complex decision-making (CDM) requires a lot of exercise. We argued that the large crisis exercises fail to offer true exercise in strategic decision-making. To improve training value, we stated that strategic decision-making has to be trained both extensively and separately before it is integrated in larger training settings such as crisis management exercises (section 2).

NDM primarily targets the development of cognitive flexibility, e.g. by Spiro [17]. That is, decision-makers should not be trained to simply reproduce knowledge, perform standard procedures nor solve standard problems. They must be competent to make decisions in unpredictable situations. Therefore, the intention is to target not only conceptual knowledge, but also the competencies needed for problem solving in entirely new situations.

From the research in Naturalistic Decision-Making (NDM), dedicated philosophies to training have emerged; Decision Skills Training [3] and JOT [19][25]. Both philosophies are based on social constructivist principles, i.e. 1) learning must be situated, hence provide authentic work environments (Brown, Collins, & Duguid [22]) and 2) the didactic setting must provide ample opportunities for students to discuss their analyses and solutions as well as to reflect to enhance reasoning skills [27].

Decision Skills Training (DST) has been applied extensively in military training for CDM, of which, for instance, the application of DST to Urban Operations training for junior leaders [36] is of particular interest to this work. DST aims at training military to 'learn like experts'. DST strives to provide students with as much relevant experience as possible in the form of a series of increasingly complex scenarios relevant to (aspects) of the decision-making. While working in these scenarios, students are trained to mentally simulate possible plans they come upon as a solution to the challenges of the scenario. Also, they are trained to extensively reflect upon their own decision-making and to make reflection a habit in their professional life.

A second dedicated approach to decision training, named Job Oriented Training (JOT) was developed at the Dutch research institute for applied sciences TNO, in close cooperation with the Royal Netherlands Armed Forces to further operationalize the social constructivist approach to CDM training. JOT is based on the principles of NDM [3] and is a partial implementation and further elaboration of DST. JOT primarily targets the development of cognitive flexibility (e.g. Spiro et al. [19]). That is, personnel in the crisis management domain should not be trained to simply reproduce knowledge, perform standard procedures or solve standard problems. They must be competent to act in unpredictable situations. In JOT, therefore, the intention is to target not only conceptual knowledge, but also the skills of independent and competent problem solving in entirely new situations.

In JOT, students are confronted with a series of short-cyclic, increasingly complex and challenging scenarios to allow them to discover the essential principles of their job. Crucial is that no theory is provided in advance; theoretical insights are acquired while solving realistic cases. This simultaneously trains problem solving in situations entirely new to them and aims at developing a 'can do' attitude in tackling new situations. Also, self-reflection is deemed crucial to conceptualize experiences and to make the concepts stick.

Both JOT and DST use a similar starting point, and JOT builds upon DST. Compared to DST Jot provides far more concrete guidelines, amongst other things, JOT prescribes the nature of instructor support, debriefing and feedback as these aspects were deemed crucial by Hays [25]. It also defines requirements with regard to the design of the virtual environments. JOT has been operationalized in a number of essentially different game-based training approaches [15][19][25]. The educational approach for the training documented here will be based on the principles of training for NDM [3] and on the operationalisation of those principles in the training method JOT [15][25] as it is the most concrete operationalisation in the safety and security domain [19].

3.2 Experiential learning

JOT is a constructivist approach to training (see e.g. [21]). Consequently, a main assumption of JOT is that participants must be actively engaged in their proficiency in order to construct tactical knowledge and skills by themselves. Learning must be experiential. This is operationalised in terms of the following 6 principles for instructional design.

3.2.1 Practice precedes theory

In the approach, for instance, it is deemed crucial that no theoretical content is provided in advance. In this context it would, for instance, be the legal regulations, the economic- and public order considerations related to a certain type of crisis. Certainly, for many years, there has been a conviction that students first need to have a solid theoretical base before they can start with the practice oriented training. Quite some evidence suggests the contrary (see e.g. [22][23]). Practical experience makes people receptive for theory, not the other way around. Hence, theoretical insights are acquired while solving realistic cases. This simultaneously trains problem solving in situations entirely new to them and aims at developing a 'can do' attitude in tackling new situations [15][24].

3.2.2 Reflective

A second premise of JOT is that experiential learning needs to be reflective. The experiences acquired need to be conceptualized and solidified. After each scenario, trainees therefore need to engage in a reflection process.

Reflection is found to be an essential part of the learning process [26][27]. Reflection relates experiences to general concepts and allows the trainees to identify potential areas where their performance could improve. This process integrates domain knowledge and the successful strategies to apply this knowledge, which are typical competencies of an expert.

Therefore, elaborate reflection is deemed crucial to conceptualize experiences and to make the concepts to be really understood and embodied.

3.2.3 Short cyclic

Also, in the JOT approach it is argued [15] that CDM training should be short cyclic. For the training of situation assessment, it is essential to confront trainees with as many different settings as possible within a given amount of time. Kolowski [28] e.g. states that '*repetitive exposure to new situations*' is crucial to train for competencies that must adaptively be applied to entirely new situations. In traditional CM exercises, due to logistic challenges, situational awareness and decision-making is generally practiced in just a single setting within a (multi) day exercise, or may not be practiced at all (section 2). In contrast, the use of virtual environments is observed [28] to allow training in several essentially different settings within the time frame of a single day where before just one setting could be completed in life exercises. With a proper reflection between the different settings, the insights acquired are seen to be applied directly to subsequent settings. This is perceived to facilitate accumulation of experiences and hence create a synergistic effect. Compared to life exercises, virtual environments allow to offer more and richer experiences by applying an increasingly "short cyclic" approach to training. Such a short-cyclic approach to training will only be possible by using low cost and less logistically challenging training approaches [15].

3.2.4 Progressively increase in complexity

Therefore, rather than working through a single large scenario in a training, it should be possible to work through a series of scenarios that progressively increase in complexity. Such series should allow to make

decisions and reflect upon those, see what mistakes are made and try again or do a next scenario, reflect etc. All of this should be possible within a limited amount of time.

3.2.5 Challenging

A fundamental assumption underlying JOT is that learning ‘the hard way’ provides the fastest track to proficiency. Consequently, a training should provide an increasingly complex series of authentic cases. Those cases should be sufficiently challenging. Educational psychology states that only by challenging people are they able to construct and apply effective strategies [22]. Underestimating trainees is a major threat to development [21].

3.2.6 Part task training

Finally, in section 2 we postulated that CDM training should be part task training, by providing dedicated training for strategic decision-making only by small exercises that isolate crucial aspects of strategic decision-making.

3.3 Educational approach requirements

This led to the following requirements; strategic decision-making has to be trained extensively, by using a learning approach that follows the following principles:

- **Part task training**, aimed at decision-making only and thus separating CDM from the procedural context,
- **Practice precedes theory** no theoretical content is provided in advance,
- **Reflective** allowing for abundant and well-designed reflection,
- **Short cyclic** allowing for fast iteration of short exercises,
- **Challenging and progressively complex scenarios** the series of scenarios have to be challenging and must progressively increase in complexity.
- **Fit in the international context** Finally, the training has to fit in the international context of the participating countries, hence: not violate e.g. crisis management system and legal aspects of the particular country of the trainee.

3.4 Training setting

Additionally, a number of practical constraints for the setting in which the training had to be applied was defined. These were firstly, practical boundary conditions:

- Series of training modules of a maximum 90 minutes each, given that this might be a proper timespan for people to be actively engaged and so that each module could be done as a whole.
- Safe Learning environment: Safe and anonymous: no information about performance or scores can become public.

3.5 Tooling

Due to the logistic challenges of life exercises in CM, we assume life exercises are suboptimal given the requirements stated above. The combination of part task training and the requirement to have a short cyclic training makes table-top decision-making gaming an attractive alternative to live training.

The development of a game was anticipated as core of the training and it was not desired to have high commanders spend time on getting to know the tooling of such a game. Therefore, user-friendliness was set as a very important requirement. Thus:

- Strategic decision-makers must be able to use the game without training and preferably without explanation: it needs to have a very simple Human-Machine Interface.

4. Tool: the DRIVER+ CM Flooding game

4.1 Demonstrator for flooding disaster

Given the requirements from the previous section, it was decided to design and develop a dilemma game as a show case for one of the modules of a high-level decision-making training curriculum. The flooding domain was chosen to be the application area because 1) it could accommodate the goal of high-Level CDM, 2) it is a common/recognizable crisis situation for most of the EU-partners and finally 3) it is used as one of the central themes in other DRIVER+ activities.

As such, a demonstrator of the DRIVER+ CM Flooding game was developed. This game is a web-based game that is to be integrated in a training session to gain experience, stimulate reflection and to share experiences between participants. The current version of the game is based on dilemmas that can be expected for high level commanders during a disastrous flooding.

The game itself is a dilemma trainer that presents a scenario in the form a briefing, about eight dilemmas and feedback in the form of a newspaper article that is personalized according to the choices made. This will give the participant an impression of how the press will write about them the day after. Below, first the design of the game is described and then it is outlined how the game is to be embedded in the decision-making curriculum.

4.2 Dilemma gaming

The design of the DRIVER+ CM Flooding game is based on the concept of the so called Mayor Game. This Mayor Game contains a framework for the training for high level policy decision-making. The Mayor Game was the result of the Netherlands research project “GATE³ Pilot Safety” (2009 – 2012) and is currently in use to provide new mayors policy decision training for crisis management. Most of the Netherlands mayors have currently been trained with one or more scenarios in the Mayor Game. The original Mayor Game has been described by Stubbe, van de Ven and Hrehovcsik, M. [5].

After serving for a number of years as a training platform for majors only, the Mayor Game was generalised to provide an engine for strategic dilemma training for crisis management scenarios. Currently an engine is available that allows the creation of dilemma games beyond the original domain of policy decision-making. The software of the engine is currently supported by the company TX-Change. TNO has rights to use the engine for research purposes, for commercial purposes a licence fee has to be paid, which varies with the number of sessions in use.

Where mayors are the actual policy decision-makers, we assume that high level commanders will have a crucial advisory role in the decision-making of the elected level, e.g. a regional governor. Hence, in the game, high level commanders are demanded to provide advice.

4.3 Embedding in the curriculum

4.3.1 Curriculum

A typical experiential training session takes place in a group of 8 - 15 participants. Each participant plays the same scenario within the dilemma game, and does that individually. Each typical experiential learning session with the DRIVER+ CM game would take in total about 90 minutes. It starts with an introduction on the goals of the session, a briefing of the crisis setting (and in the first sessions an explanation of the use of the game).

³ <http://gate.gameresearch.nl/>

Then the game is played, which takes 20 minutes. The remainder of the time is dedicated to reflection, see section below.

No theory is provided in advance, yet the participants are stimulated to afterwards research the issues that have come up in the dilemmas.

The overall strategic decision-making curriculum should incorporate about five experiential learning sessions, including reflections. A series of five sessions would allow decision-makers to experience five totally different settings and allow for a gradual progression of complexity within the scenarios. As the total of five sessions can be completed in less than two days, we consider such a curriculum to be short cyclic.

In each of the sessions, they should receive advice from a highly similar set of advisors, so that by repetition they will get to understand the advisers' perspectives.

4.3.2 Reflection

In the reflection phase, the players debate their experiences within groups of preferably max six participants. Issues for reflection here are for instance:

Perception on the dilemma's

The question that will be addressed here is 'which dilemmas were hard and why?'. Such a question will give rise to a reflection upon the different perspective amongst participants on the dilemma's. Basically, the actual answers to the dilemmas are not important at all. The responses to real dilemmas can never be right or wrong; only the societal impacts in the real situation determines, in hindsight, if this was the most effective decision. Therefore, the thoroughness of the decision process is more important. The trainer will stimulate reflection on this process and invite participants to share earlier experiences with similar incidents.

Value of the advices provided

The participants will see how different a problem can be perceived, how different they value the advices provided based on the different perspectives possible (technical, community, media etc). They will need to discuss previous experiences of the players and their leadership style to understand the differences in decisions made.

Popular acceptance of interventions

It is essential to debate the appreciation of interventions taken by the population. What did one perceive from the feedback in terms of unease, distrust and negative effects on political reputations. Here the question is relevant whether these effects could have been avoided, or whether they are a fact of life and have to be handled as best as possible.

Preferential styles

Some commanders will approach a problem from a very technical point of view, others will predominantly consider issues in the community. Some will have a more eclectic style. Style is an issue to be discussed to make commanders aware that their personal style affects decision-making.

4.4 Link

The game can be played using the following link:

<https://research.txchange.nl/game/DemoTXchange/#>

Account: ssr1781 / **Password:** d4896 / **Select scenario:** Flooding / Then '**test scenario**'

The dilemmas are activated by clicking on one of the envelopes at the left hand side.

At each dilemma there is advice, click on the 'i' above the heads of the advisors. If one wishes to reread the advice, use the right hand side column.

4.5 The DRIVER+ CM Flooding game

4.5.1 Briefing

The scenario starts with an introduction of the context (see Figure 4.1 and Figure 4.2), the overall scenario, including this text, can be found in Annex 2. Participants are being given a map on paper of the situation, showing the river, the dam, the city and villages upstream and areas prone to flooding, so that they can make notes on it.



Figure 4.1: Introduction to the setting



Figure 4.2: Situational map

4.5.2 The dilemmas

The situation evolves over a period of roughly two weeks, where each of the dilemmas is introduced by a short description of the actual situation leading to the decision to be made.

Dilemmas are introduced with a few lines of text and end with a question (see Figure 4.3). As said, we assume that the high-level commander provide advice to a policy maker, hence the question always refers to an advice. The advice is always binary, participants need to answer this question with ‘yes’ or ‘no’.



Figure 4.3: Dilemma screen

Decisions can be e.g. classical moral dilemmas such as the blue box example in section 2 about either flooding villages upstream with the certainty of a limited number of deaths or not flooding upstream with a certain risk of a dam breaking, which- in case the dam breaks- will cause large numbers of casualties.

Or decisions can be typical policy decision that require a prioritisation amongst mitigating various societal impacts, such as the example below.

Dilemma priorities

The people are looking at us for help with the recovery. The cattle is in meagre conditions as they were evacuated late, they were in the water for a while and had to be herded into an area with too limited space. We have been notified that the drinking water there may be contaminated due to industrial pollution and that it is not sufficiently clean to use for the cattle. Also, the area's economy has been affected heavily, business is losing collectively about 500,000 euro per day.

The options are:

1. Clean/restore the economical/industrial area
2. Clean/restore the agricultural area

Will you advise to clean up and restore the agricultural area first: [yes, no]

Below in the light blue box, one such a classical moral dilemma (from the Flooding game that was designed in this work package (T934.12), as an example for a complex decision that high-level commanders might have to make.

Dilemma Flood upstream

The water has risen further due to torrential rains and the dam is under serious threat for the next 48 hours. If the dam breaks, the whole the city of Urbany might be flooded, causing many casualties.

There is a possibility to flood some areas upstream that will release the pressure on the dam so that it will not break. The upstream area is a predominantly agricultural area with two villages (approx. a total of 5000 people) and a lot of cattle. The water level will be so high that the houses will be flooded. It is, however, too late to properly evacuate the inhabitants. At least the elderly people will not survive.

Will you advise to flood the upstream area: [yes, no]

4.5.3 Information elements

During crises, high level commanders usually have access to advisors; in the game those digital advisors are available for advice and extra information (see example in Figure 4.4). For each of the dilemmas, there will be five to six advices from the following perspectives:

- Economic.
- Technical.
- Political.
- Media.
- Legal.
- Community.

Generally, these advices will be designed so that two to three advices will lead to the first option and again the other two or three will suggest the second option. Hence, the overall outcome will always be inconclusive. It is up to decision-maker to make a hard decision, a decision that will basically have an outcome that will either way affect the communities, hence there will always be a double bind.



Figure 4.4: The advices, in this case the advice of the technical advisor.

Once a dilemma has been answered, the participant is asked to record what information items were important to decide on this dilemma.

4.5.4 Anticipating on popular appreciation of interventions

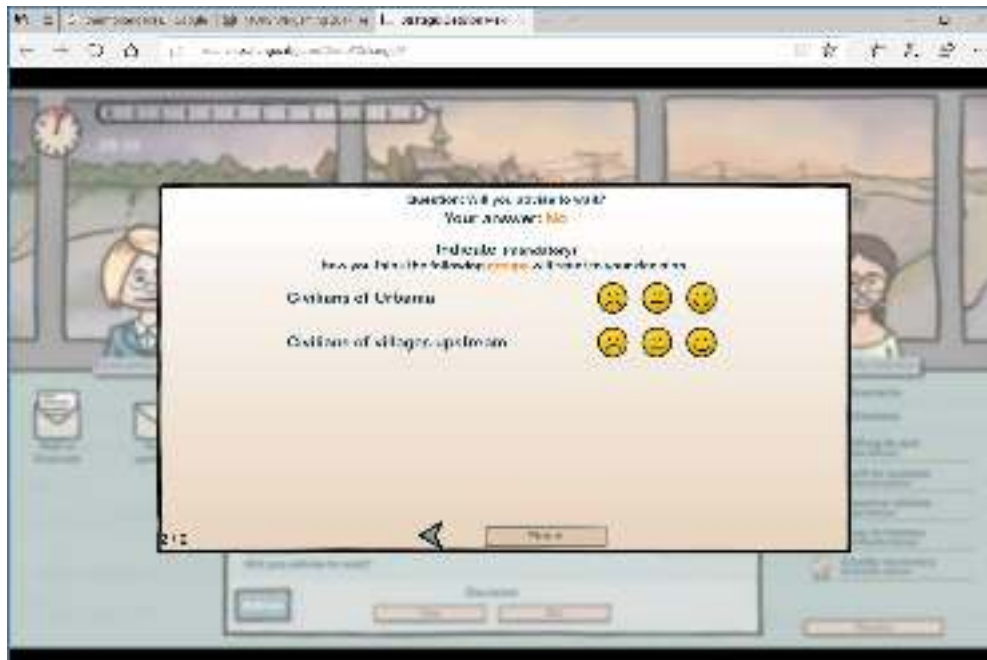


Figure 4.5: Empathy indication

To make decision-makers aware of the effect of their decisions on their population(s) after each dilemma one is asked to indicate how they anticipate their decision is being appreciated by 1) the civilians of Urbany and 2) the civilians of the upstream villages (see Figure 4.5). Evidently, these two populations frequently have competing interests. We have named this indication the “empathy indication”.

4.5.5 Feedback on the decisions

The feedback to the decisions made by the trainee is being provided in the form of a newspaper article that is personalized according to the choices made (see example in Figure 4.6). This gives the player an idea of how their decision-making would be appreciated by the press. Here it will become evident, that, whatever decision was made, the press may see negative consequences. This is to make clear that there are no ‘good’ decisions and to prepare high level decision-makers for the way the press can scrutinise decision made with the best intentions.



Figure 4.6: Feedback by means of a Journal article.

4.5.6 Feedback on style

Finally, the participants can look-up indication of e.g. the time it took them to answer to a dilemma, which might be an indication of the complexity of that dilemma. Participant are also given an indication of their preferential style. Preferential style give insight in which kind advice is usually followed. An example of the indication of style is shown in Figure 4.7.



Figure 4.7: Style indication

5. Testing

For testing and validation of the game based approach to decision-making training, we applied a *Concept Development & Experimentation* (CD&E) approach, as outlined in DRIVER Deliverable D23.21 - Performance and Effectiveness Metrics in Crisis Management Experiments [30].

In total, two tests of subsequent prototypes were conducted and each time the prototype was adjusted and subsequently tested internally before moving on to an external test. We ended with a larger scale validation of the final version of the game.

5.1 Test 1

After a few rounds of internal testing within TNO, the first external test was conducted within the project team. 7 WP54 team members (experts from Israel, Sweden and the Netherlands) from different institutes individually played the game and we held a 40 minute long collective reflection upon the findings.

5.1.1 Outcomes

Main comments on the basis of test 1 were:

1. The game provides a sound basis and set up to do experiments in other EU-countries.
2. Suggested improvements:
 - a. Add a dilemma concerning the place to evacuate to (in a near area or a distant area / country with the risk of people not returning later on).
 - b. Maybe add more time pressure or limit the advisors that can be consulted per dilemma.
 - c. Give the dilemma's an extra focus on "saving peoples life".
 - d. Give one or two dilemma's more emphasis on legal issues (i.e. who can decide on evacuation).
 - e. Make the newspaper messages (in the feedback part) more confronting (less explaining the dilemma).
 - f. Correct some typo's and illogical advises (noted separately).

Based on the evaluation, input and viewpoints from different advisors were added (e.g. economic advisor, technical advisor, political advisor, media advisor, legal advisor and community advisor) and dilemmas were rephrased to increase their face validity. All suggestion listed above were implemented, except for the suggestion to place more emphasis om legal issues. As the legal systems are different for the different EU countries, we struggled to create new dilemma's that could be sufficiently generic to all EU countries.

5.2 Test 2

The second test was performed with 2 groups of students, one was a group of military officers (10 students) close to graduation and one was a class in game design and concepts (16 students) at bachelor level.

5.2.1 Outcomes

Both groups commented on typos, layout issues and graphics. The typos were corrected. Some layout issues couldn't be solved in the current version of the game, but are likely to be solved in next versions of the engine. Main commentary on the graphics was that the graphics might be too playful. The graphics are also built in in the game-engine and cannot easily be changed.

So, we decided to question the final target group the nature of the graphics. If this group should think that the graphics are indeed not appropriate for the target group, they would have to be changed in the game-engine.

With regard to the game concept:

The game-concepts students predominantly commented the following:

- **Agency:** the game-concept students found the game-concept quite unconventional. They expected to find a simulation where they could try out all kinds of interventions and just see the effects on flooding, and go back and try again. This isn't possible in the current game. As such they expected to have more agency.

The current game is scripted to a large extent and in that, the difference between a simulation-based game and the current game is that the costs of creating a sufficiently realistic simulation would start at 200K Euro and might rise to about 500K Euro, while a new scenario within the current dilemma game engine could be created for an amount of between 30-50K Euro, depending on the experience of the designer.

We decide to explicitly test in the final validation whether the target group noted a lack of agency, and if so, whether they found lack of agency problematic.

5.3 Developing a demonstrator

After this second test, an improved version was developed that we considered to be a sufficiently playable demonstrator of the game concept. In this round of improvement, the following was modified:

- Split up one dilemma as it was found to address two separate issues at a time.
- Addition of one more dilemma on prioritising the rescue of civilians.
- Addition of more richness to the feedback news-paper.
- Improvement of the style indications.

This demonstrator was tested by four persons internal to TNO and again several typo's and layout issues in the feedback were improved.

5.4 Validation

Originally two validation sessions were planned with high level commanders in Poland and in the UK. While planning these sessions, the project was halted. After the restart of the project we had to decide on a different test-group. We managed to obtain two 3-hour slots for testing in the UK Connections wargaming conference in September 2017, at Kings College London.

5.4.1 Test group

We announced the testing in advance so that people who assumed to be part of the target audience for this type of game could sign up to be part of the validation. The participation was thus voluntary.

The Connection conference attracts an audience of experienced professionals from Europe and the US in the field of training games and simulations for both the safety and security domain and 21 of them signed up for the validation session. In this way we managed to recruit an international group of civil and military personnel with sufficient expertise in the field of safety and security. The participants came from the UK, the US (5) and Finland (1). Besides, before we tested with people from the Netherlands, from Israel and from Sweden and discussed whether the dilemmas would suit their organisation and legal systems.

In the questionnaire we asked what their profession was and how experienced they were in decision-making within safety and security.

We did not ask for the names of the participants, age, nor gender as we did assume this not relevant and it guaranteed anonymity. We did link the questionnaires to the particular logs of the participants game session.

5.4.2 Test approach

Each participant was explained the procedure of testing and subsequently introduced to the domain and to the game and was given 20 minutes to individually complete the scenario in the game. After that they completed a questionnaire (see Annex 1) and we held a 10 minute reflection to gain insights that might not have been captured by the questionnaire. Those comments have been listed below in relation to the question addressed.

All interactions in game have been logged and were analysed on time used to complete a scenario, the advisers consulted and the resulting decision-making styles.

The questionnaire focussed on:

- Content of the scenario, separate dilemmas and the advices.
- Process, which included a question on the perceived agency in the game.
- International context, i.e. addressing the issue whether the content of the training was considered to be sufficiently realistic given the participants national crisis management system.
- Learning goals, asking for the participants perception of to which extent the stated learning goals could be reached with a curriculum encompassing 5 of these games (including reflections).
- Educational approach, addressing the adequacy of part task training, the extent to which the game based training was perceived to be challenging and questioning whether the participant found the game sufficiently serious – and thus not too playful.
- Tooling, assessing whether the UI of the game was easy to use and sufficiently self-explanatory.

The results of the questionnaires and the logs have been described in the next section.

6. Results

In total 21 people participated in the validation process. The questionnaire and answers to the questionnaire can be found in Annex 3. Some questions were not answered by some of the participants.

6.1 Results from the logs

In total 21 people participated, where one of the participants did not finish, and only finished the first 6 dilemmas.

6.1.1 Validity of the dilemmas

Table 6.1 shows how participants answered the various dilemma's and how long it took them to make a decision. We looked at this data to find out whether the decisions were considered to be dilemma's and whether the dilemmas were sufficiently challenging but not too complex.

A decision was considered not to be dilemma or just too easy if 1) it would take the participant little time to answer and 2) the answers would be skewed towards one answer alternative. From this data, we do see that e.g. the press conference has a skewed answer, that is, 86% of the participants decide that they will actually advice to give a press conference. Yet, still it takes them a lot of time to get to this answer. Therefore, we still conclude that this decision is not necessarily too easy. However, some participants commented that for them it would not be a dilemma, as they would have a legal obligation to inform civilians of the current state of affairs.

Table 6.1: Answers to the dilemmas

Dilemma	Question	Answer		Duration in seconds mean
		yes	no	
Wait or Evacuate	Will you advise to wait?	43%	57%	102,57
Flood upstream	Will you advise to flood the upstream area?	33%	67%	57,14
Press conference	Will you advise to give a press conference?	14%	86%	129,10
Which area	Will you advise to decide to open the locks?	29%	71%	60,57
Use citizens or not	Will you advise to put civilians to work?	57%	43%	74,62
Looting	Will you advise to ask for support from the army?	33%	67%	80,90
Priorities to clean-up	Will you advise to restore the economical/industrial area first?	70%	30%	84,50
Returning home	Will you advise to allow people to return home?	50%	50%	119,47*

* $p=.060$

A between groups ANOVA was conducted to examine the effect of answer on the duration of each dilemma. A trend was found between the answer on the dilemma 'Returning home' and duration in seconds (Figure 6.1), $F(18)=4.070$, $p=.060$. People who advise to allow people to return home (answer = yes) needed a shorter time to make their decision. For the other dilemmas no effect was found.

6.1.2 Duration

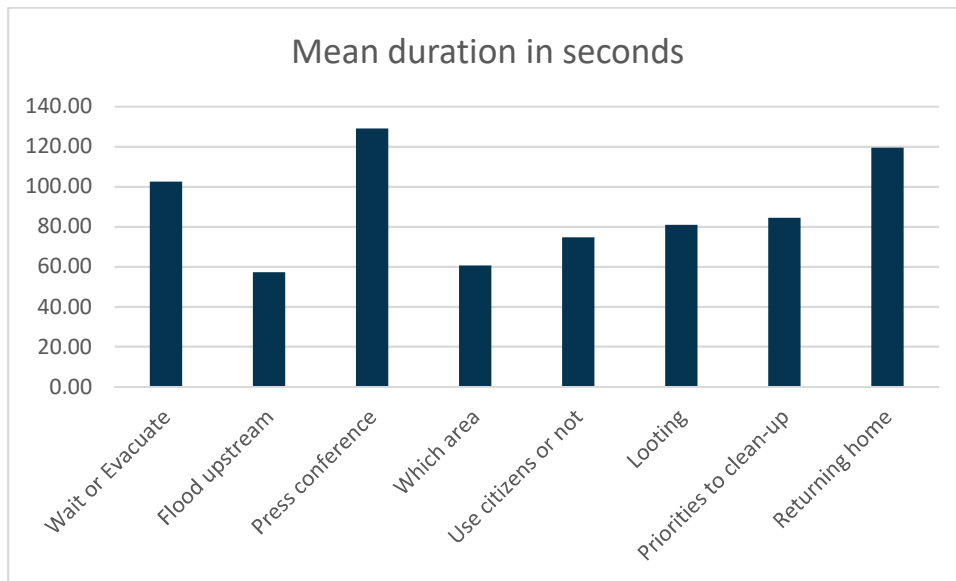


Figure 6.1: Mean duration in seconds

6.1.3 Style

We gave feedback on the preferential styles. This feedback was basically based on the extent to which people followed the advice of a certain advisor and the extent to which they indicated the advice to be important.

Table 6.2: Personal style

Personal style	
Community	53,0%
Economy	55,0%
Legal	61,7%
Media	70,0%
Political	54,8%

Each of the styles was indicated by a percentage, the total doesn't add up to 100% (see Table 6.2). The lowest ranking style is that of the community (red). Most of the people had a media style (green).

6.1.4 Information sources

A second analysis on the logs focused on which information sources the participants used and found useful. Useful per advisor: Table 6.3 shows the average percentage of which the advisor was indicated useful when the advice was opened. The top 3 are indicated green in Table 6.3, the lowest three are red.

Table 6.3: Use of information sources

Advisor type	Mean
Community Advisor	47,20%
Economic Advisor	51,03%
Legal Advisor	43,94%
Media Advisor	37,92%
Political Advisor	23,81%
Technical Advisor	60,93%

In Table 6.4, the data is shown for the in-game questionnaire: “Which advisors did you find useful?”.

Table 6.4: Indications of usefulness of advisors

	Useful	Not useful
Community Advisor	7/17	2/17
Economic Advisor	8/17	1/17
Legal Advisor	5/17	3/17
Media Advisor	6/17	4/17
Political Advisor	3/17	3/17
Technical Advisor	14/17	0/17

Based on Table 6.4, some people found the political, media and legal advisor not useful (red), while most participants found the technical, economic and community advisor useful (green).

The top three are indicated green in Table 6.4, the lowest three are red.

6.1.5 Empathy indications

To test empathy, in the game for each of the decisions the participants were demanded to indicate how the decision would be appreciated by 1) Civilians of Urbania and by 2) the Civilians of the upstream villages (see Table 6.5 and Table 6.6).

Table 6.5: Collection of answers regarding empathy

	Negative	Neutral	Positive
Civilians of Urbania	31%	35%	34%
Civilians of villages upstream	29%	43%	28%

Table 6.6: Empathy indications

Dilemma	Civilians of Urbania				Civilians of villages upstream			
	NEGATIVE	NEUTRAL	POSITIVE	N	NEGATIVE	NEUTRAL	POSITIVE	N
1	10	7	4	21	5	12	4	21
2	2	10	9	21	17	0	4	21
3	3	11	7	21	7	7	7	21
4	7	11	3	21	6	7	8	21
5	7	8	6	21	4	15	2	21
6	5	3	13	21	2	12	7	21
7	10	3	7	20	3	5	12	20
8	6	6	8	20	3	14	3	20
Total	50	59	57	166	47	72	47	166

7. Conclusions

This document reports about the development and testing of a method and tool for DMC training for high level decision-makers. The work is performed under the former driver topic evolved learning [WP5] and has been finished in the context of the DRIVER+ programme (SP93 Solutions). The work reported here aimed:

- To identify the training needs of high-level decision-makers in crisis situation with regards to the crisis management process and context.
- To create a demonstrator for training program for Decision-Making Context (DMC) training. Check the effectiveness and usability of the developed training in different countries.

As primary training needs (section 2) were mentioned:

- Building situational awareness, amongst other things based on various perspectives of the staff available.
- Handling strategic dilemmas in crisis-management.
- Handling double bind situations with advisors providing conflicting advice.
- Anticipating on popular appreciation of interventions.

A demonstrator for a training program for DMC training “the DRIVER+ CM Flooding game” was developed (section 4) and the embedding in the curriculum was outlined. The demonstrator was tested in several rounds and validated with participants from different countries (sections 5, 6). The following section outlines the main conclusions from the validation of the DRIVER+ CM Flooding game.

7.1 Meeting the learning goals

To have a proper CM decision training, it was anticipated that a curriculum of about 5 modules would be needed that each would start with a game based session and be followed by a structured reflection within the target group of high level commanders. As in this project a demonstrator for one module was developed and, as such it was not possible to assess the effectiveness of the full training curriculum.

To gain at least some grip on this issue, in the validation the participants were demanded to give a subjective assessment on the following question: “Assuming that crisis managers would be trained with a series of at least 5 of these game based scenario’s, to which extent would this training make them better in complex decision-making in actual crisis situations?”.

The participants were fairly positive in their answers, with most indications between moderate and extremely good (*section 4*). Evidently, this is a subjective judgement, so the value of this is limited, but it suggests that the development of the current module may be on the right track.

7.2 Content of the game

7.2.1 Overall scenario and dilemma’s

To find out whether the decisions were considered to be real dilemma’s and whether the decisions were sufficiently challenging but not too complex, data on the nature of the answers to dilemmas and the duration was collected. The data showed (section 1) that 7 out of 8 decisions were considered to be true dilemmas within acceptable boundaries, one decision (providing a press conference) was not considered to be a true dilemma, but it seemed to be hard decision anyway. Also, in the questionnaire, all but one participant found the dilemma’s sufficiently realistic and all participants found the overall scenario sufficiently realistic. Interestingly, some participants did not experience any double binds, although their answers suggest that it might not have been explained sufficiently well what was meant by this.

Finally, the question was posed whether the dilemmas were valid at the strategic level. Here 15 out of 18 participants said ‘yes’, so it is assumed that the level was actually strategic (cf. section 1).

All in all, we conclude that the dilemmas are at the right level (strategic) and that the overall scenario and the dilemmas are sufficiently realistic and challenging.

7.2.2 Information sources

From the logs we can derive that the technical, economic and community advisers were assumed to provide the most useful advice, while the legal, media and political advisors were indicated to be least useful. The estimates in the questionnaire were almost similar, with the technical advisor evidently most important and then economic, media, community and legal and finally the political advisor, with only three people stating their relevance.

We will need to go back to the details of the advices to understand why e.g. the legal and the political advice were not deemed valuable and see whether these need improvement or whether the current case just has more relevant technical aspects (and economic and media) to be considered.

7.2.3 Feedback

The feedback needs work to make it more adequate. Only 60% of the participant found the feedback (the newspaper article) sufficiently realistic. The generated newspaper didn't seem to report positives and was perceived to be a little bit cut and paste. Still others provided positive comments such as: "yes, that is how the media works".

We concluded that the generated narrative in the feedback needs improvement, both to make the narrative flow more naturally (less cut and paste) and have a look at the nature of the feedback and find elements that can be improved.

7.3 Process

7.3.1 Agency

To estimate the agency participant felt, they were asked "Did your decisions sufficiently affect the course of events?" This question unfortunately did not give a clear indication of the feeling of agency. Few people answered this question. Some participants stated that they believed so, but couldn't be sure as they didn't know what results different decisions would have given. The outcome here is inconclusive.

7.3.2 Emotions

Most participants reported some emotions. To help structure emotions, there is need for a vocabulary of emotions to reason with and a method to do so. First, the vocabulary will be considered by proposing an emotional framework based on Robert Plutchik's wheel of emotions [31].

The wheel of emotions visualizes eight basic emotions: joy, trust, fear, surprise, sadness, disgust, anger and anticipation (Figure 7.1).

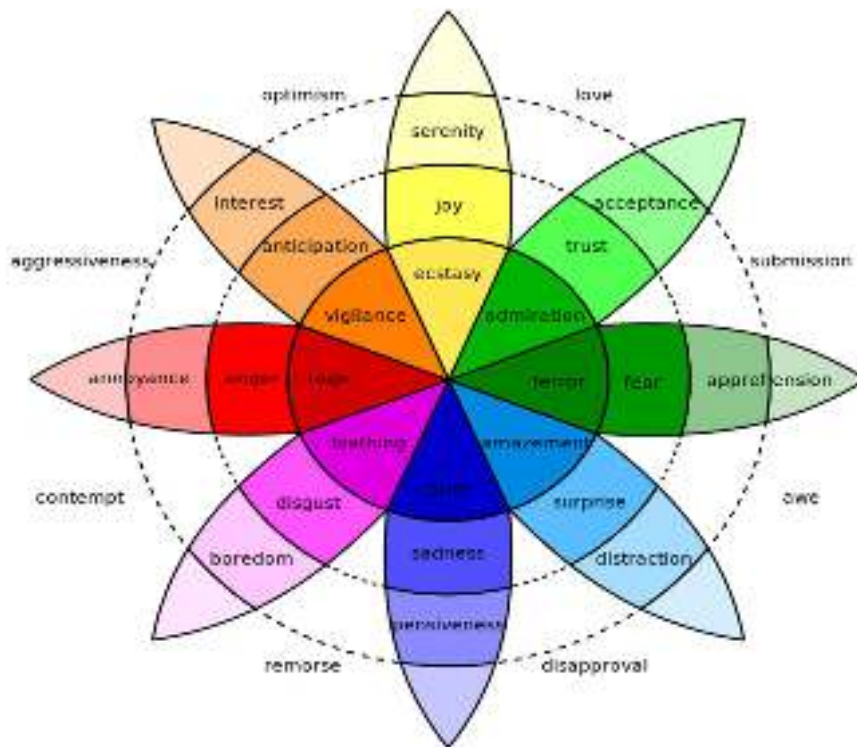


Figure 7.1: Wheel of emotions [31]

The predominant emotions that were reported by the participants are on the anger (*anger, frustration*) axis and on the fear (*fear, worried, concern, feels insufficient, anxiety*) axis (section 0).

7.4 Educational approach

All participants were positive about the idea to provide part task decision-making training for high level commanders separate from crisis-management exercises. Also, they found the game sufficiently “Serious” (cf. section 0).

7.4.1 International context

On the basis of the questionnaires, it could not be concluded that the demonstrator based training did fit in the international context of the participating countries. Too few people answered this question. Some participants said it did fit their countries CM system, others were not sure (section 3). This aspect requires further analysis.

It should be noted though that in design of the dilemma care was taken to stay away as much as possible from the legal aspects of crisis management decision-making.

7.4.2 Tooling

The game tested here was meant to be the core of the training and the intention was to not have high commanders spend much time on getting to know the tooling of such a game.

On the question ‘could you work with the game without additional training or explanation?’, most participant answered positive (section 6). Some participant needed limited explanation, while others said the UI was pretty easy and intuitive. It is assumed that the interaction with the UI of the game is sufficiently easy.

References

- [1] Laist, I. (ed.): D540.1 Method and tool for training decision-making process. Deliverable of the DRIVER project, [2016].
- [2] Orasanu, J., & Connolly, T. (1993). The reinvention of decision making. In G. A. Klein, J. Orasanu, R. Calderwood, & C. E. Zsombok (Eds.), *Decision making in action: Models and methods* (pp. 3–20). Norwood, NJ: Ablex.
- [3] Klein, G. (1998). *Sources of Power, How People Make Decisions*. Cambridge, Massachusetts: The MIT Press.
- [4] Klein, G. (2003). *The power of intuition*. New York: Random House, Inc.
- [5] Stubbé, H. · Ven, J.G.M. van de · Hrehovcsik, M. (2014). Games for top civil servants: An integrated approach. *Cases on the Societal Effects of Persuasive Games*, 32-50
- [6] ECLAC. (2003) *Handbook for estimating the socio-economic and environmental effects of disasters, Mexico*.
- [7] FEMA. (2002) *HAZUS-MH MR5*, Washington D. C.
- [8] Launge, A., Hernantes, J., Sarriegi, J.M. (2013). *Disaster Impact Assessment: A Holistic Framework*. Proceedings of the 10th International ISCRAM Conference – Baden-Baden, Germany, May 2013 T. Comes, F. Fiedrich, S. Fortier, J. Geldermann and T.Müller, eds.
- [9] D840.11 - Societal Impact Assessment Framework. Deliverable of the DRIVER project, [201**].
- [10] Bronzwaer, S. (2011, August 11). Extreem-rechts wil BBQ, wat nu?. *NRC Handelsblad* (Dutch Newspaper) [interview with two mayors who have played the game].
- [11] Helsloot, I., *Vorbij de symboliek, Over de noodzaak van een rationeel perspectief op fysiek veiligheidsbeleid*, Boom Juridische Uitgevers, Den Haag: 2007.
- [12] Boin, R.A., 't Hart, P., Stern, E. and Sundelius, B. (2005). *The Politics of Crisis Management: Public Leadership Under Pressure*. Cambridge: Cambridge University Press.
- [13] Frijda, N.H. (1987). Emotion, cognitive structure, and action tendency. *Cognition and Emotion* Vol. 1 , Iss. 2.
- [14] Izard, C.E., Kagan, J., Zajonc, R.B. (Eds.), *Emotion, cognition, and behavior* (pp. 17–37). New York: Cambridge University Press.
- [15] Hulst, van der A.H., Muller, T.J., Buiel, van Gelooven, D., Ruijsendaal, M. (2014). Serious gaming for complex decision making: training approaches. *Int. J. of Technology Enhanced Learning*, 2014 Vol.6, No.3, pp.249 – 264.
- [16] Helsloot, I. (red), *Op de grens van werkelijkheid, Observatierapportage oefening Bonfire: COT*, Den Haag 2005.
- [17] Spiro, R. J., Feltovich, P. J., Jacobson, M. J., & Coulson, R. L. (1991). Knowledge representation, content specification, and the development of skill in situation-specific knowledge assembly: Some constructivist issues as they relate to cognitive flexibility theory and hypertext. *Educational Technology*, 31 (9), 22-25.

- [18]D540.1 Method and tool for training decision-making process.
- [19]Stehouwer, M., Serné, M. & Niekel, C. (2005). A tactical trainer for air defense platoon commanders. In: Proceedings I/ITSEC 2005. Orlando, FL.
- [20]Canon Bowers, J. A., Tannenbaum, S. I., Salas, E. & Volpe C. E. (1995). Defining competencies and establishing team training requirements. In R. Guzzo & E. Salas (Eds). Team Effectiveness and Decision-making in Organisations. San Francisco, CA: Jossey Bass
- [21]Cohn, Ruth & Carley, Kathleen & Harrald, John & Wallace, William. (2000). Emotions in Crisis Management: An Analysis of the Organizational Response of Two Natural Disasters. International Journal of Technology Management.
- [22]Brown, J.S., Collins, A., Duguid, P. (1989). Situated Cognition and the Culture of Learning. In: Educational Researcher, 18-1, jan./febr. 1989, p. 32-42.
- [23]Bransford, J.D., Brown, A.L. & Cocking, R.R. (editors) (2000). How people learn: Brain, Mind, Experience, and School. Washington, D.C.: National Academic Press.
- [24]Siegler, R.S. (1996). Emerging minds: The process of change in childrens thinking. New York: Oxford University Press.
- [25]Hulst, van der, A.H, Muller, T.J., Besselink, S., Coetsier, D & Roos, C.L. (2008). Bloody Serious Gaming – Experiences with Job Oriented Training. Proceedings: Interservice/Industry Training, Simulation, and Education Conference (I/ITSEC) 2008.
- [26]Boud, D., Keogh, R. & Walker, D. (eds.) (1985) Reflection. Turning experience into learning. London: Kogan Page.
- [27]Dewey, J. (1933) How We Think. A restatement of the relation of reflective thinking to the educative process (Revised edn.), Boston: D. C. Heath.
- [28]Kozlowski, S. W. J. (1998). Training and developing adaptive teams: Theory, principles, and research. In J.A. Cannon-Bowers & E. Salas (Eds.), Decision making under stress: Implications for training and simulation (pp. 115-153). Washington, DC: APA.
- [29]Hulst, van der, A.H., Amade, C.A.R. & Sain, de, G. (2011b). VTT-C-IED: Threat assessment and planning for search using virtual environments. Nato Research and Technology Organisation - MP-SET-175.
- [30]Driver Deliverable D23.21 - Performance and Effectiveness Metrics in Crisis Management Experiments.
- [31]Plutchik, Robert (1980), Emotion: Theory, research, and experience: Vol. 1. Theories of emotion, 1, New York: Academic
- [32]Child, John & Elbanna, Said & Rodrigues, Suzana. (2016). The political aspects of strategic decision making. The Handbook of Decision Making. 105-137.
- [33] Perla, Peter P. 1990. The art of wargaming : A guide for professionals and hobbyists. Annapolis, Md.: Naval Institute Press.

Annexes

Annex 1 – DRIVER+ Terminology

In order to have a common understanding within the DRIVER+ project and beyond and to ensure the use of a common language in all project deliverables and communications, a terminology is developed by making reference to main sources, such as ISO standards and UNISDR. This terminology is presented online as part of the Portfolio of Solutions and it will be continuously reviewed and updated⁴. The terminology is applied throughout the documents produced by DRIVER+. Each deliverable includes an annex as provided hereunder, which holds an extract from the comprehensive terminology containing the relevant DRIVER+ terms for this respective document.

Table A1: DRIVER+ Terminology

Terminology	Definition	Comment
Crisis	Situation with high level of uncertainty that disrupts the core activities and/or credibility of an organization and requires urgent action	
Crisis Management	Holistic management process that identifies potential impacts that threaten an organization and provides a framework for building resilience, with the capability for an effective response that safeguards the interests of the organization's key interested parties, reputation, brand and value creating activities, as well as effectively restoring operational capabilities. Note 1 to entry: Crisis management also involves the management of preparedness, mitigation, response, and continuity or recovery in the event of an incident, as well as management of the overall programme through training (, rehearsals and reviews to ensure the preparedness, response and continuity plans stay current and up-to-date.	
Exercise	Process to train for, assess, practise and improve performance in an organization Note 1 to entry: Exercises can be used for validating policies, plans, procedures, training, equipment, and inter-organizational agreements; clarifying and training personnel in roles and responsibilities; improving inter-organizational coordination and communications; identifying gaps in resources; improving individual performance and identifying opportunities for improvement; and a controlled opportunity to practise improvisation. Note 2 to entry: See also test.	
High-level decision-maker	See: Strategic decision maker	

⁴ Until the Portfolio of Solutions is operational, the terminology is presented in the DRIVER+ Project Handbook and access can be requested by third parties by contacting coordination@projectdriver.eu.

Terminology	Definition	Comment
Lesson Learned	Lessons learning: process of distributing the problem information to the whole project and organization as well as other related projects and organizations, warning if similar failure modes or mechanism issues exist and taking preventive actions.	
Scenario	Pre-planned storyline that drives an exercise; the stimuli used to achieve exercise objectives [pre-planned storyline that drives an exercise, as well as the stimuli used to achieve exercise project performance objectives].	
Skill	Ability to perform a task or activity with a specific intended outcome acquired through education, training, experience or other means	
Strategic decision-maker	The individual who has the power and is tasked to take a strategic decision. These are elected officials, and high-ranking personnel in response organizations / relevant authorities / agencies tasked with the response to the crisis.	
Training	Activities designed to facilitate the learning and development of knowledge, skills, and abilities, and to improve the performance of specific tasks or roles	

Annex 2 – Scenario

Backstory

You are a high level commander at the regional level of the Wetlands. As a high level commander your main focus is on strategic decision-making.

The Wetlands is a relatively prosperous region in the delta of the river Aqua. As most of the country is mountainous and arid, the economic activity of the country is concentrated in the Wetlands. The Wetlands, however, are a region that is vulnerable to flooding, as the many floods in the history of the Wetlands prove. Over the years, many measures have been taken to defend the area from floods. In recent years the policy concerning the protection of the Wetlands to floods have changed to stimulate economic growth of the area. Over 200 years it used to be forbidden to build any industry in the floodplains. However, 30 years ago it was agreed that a number of sustainable flood mitigation solutions had to be achieved to stimulate the regional economy and thus to allow establishing industry in the floodplains. It was decided not to aim at full protection and control, but to experiment with a wide range of flood risk options. Such as building a dam to control the water-flow to the most populated areas. It was calculated that the city and industrial area would flood every 300 years and that was assumed an acceptable risk.

In the past 10 years, things seem to have changed in the region:

- Some minor flooding occurred due to dangerously high water levels of the Aqua
- Many more industries have settled in the floodplains resulting in more urbanization as well.
- In the regional board, there has been lot of debate about the need to have water retention basins, however, as this would consume a lot of highly fertile agricultural space, the regional conservative party blocked all decision-making and the political debate has not come to a conclusion.

Today, in early spring, snow is melting from the mountains and a period of extremely bad weather caused the Aqua to rise to dangerously high levels.

Dilemma 1: “Wait or evacuate”

The water level is still rising and the expectation is that it will rise the coming 48 hours. The water level at the waterworks dam is critically high. The dam will probably hold for 10 to 14 hours, but it is not guaranteed that it will hold the next 48 hours. If the dam breaks, the East part of the city of Urbany with a population of approx. 20.000 people will be flooded and many small businesses will be affected. It is at present just after midnight.

The options are:

1. Wait for the next 5 hours (and see how the water level and stability of the dam evolves).
2. Evacuate the east part of Urbany immediately.

“Will you wait?”

No Media advisor It is good to show that you are making decisions and are willing to act. Waiting for the next hours will make you look passive.

No Legal advisor: I am not sure if it is in your jurisdiction to decide on an evacuation of an area but when the dam breaks, legal claims will be massive.

Yes Community advisor: Of course you have to monitor carefully, but as it is the middle of the night, waiting for a few hours will have the least impact on the community for now.

Yes Technical Advisor: If the dam breaks, the estimate is that the water-level in the streets of Urbany will be 1 meter. However, the dam is built to sustain to water levels much higher than the current level and it did sustain a far higher level at least three times in the past 30 years.

No Economic Advisor You have to notify the people now so that they can take measures to evacuate their belongings and to protect the stores.

Dilemma 2: “Flood upstream”

It is 10 hours later. The water has risen further due to torrential rains and the dam is under serious threat for the next 48 hours. If the dam breaks, the whole the city of Urbany might be flooded causing many casualties.

There is a possibility to flood some areas upstream that will release the pressure on the dam so that it will not break. The upstream area is a predominantly agricultural area with two villages (approx. a total of 5000 people) and a lot of cattle. The water level will be so high that the houses will be flooded. It is, however, too late to properly evacuate the inhabitants. At least the elderly people will not survive.

You will have to act now. “Will you flood the upstream area?”

No Media advisor No, I beg you not to sacrifice the people in the villages. You will have to evacuate Urbany immediately but you cannot let the elderly people drown.

No Legal advisor I don’t know what to say. I have not legal advice, you will have to decide.

Yes Community advisor If the dam breaks, the people of Urbany will be trapped totally. So many people will drown, you can’t let that happen.

Yes Technical Advisor The water has never been so high at the dam and I am really concerned that the dam will break. The number of people that will die is much larger than in the villages.

Yes Economic Advisor: If the dam breaks, at least 1/3d of the city of Urbany and the industrial section will be wiped away. It takes at least 5 years and a substantial budget to rebuild the whole region. Also the sweet water supply as well as the power supply to the region will be hampered severely. So don’t wait.

Dilemma 3: “Press”

Journalists are asking a lot of questions. They wonder if you made the right decision. There are asking for an immediate press conference about the current situation, and the decision you made.

The options are:

1. You do give a press conference at this time.
2. You refrain from commenting to the press.

“Will you give a press conference?”

Yes Media advisor: It is good to inform the press and public about your decisions, your considerations and the way ahead. Otherwise rumours will take over!

No Legal advisor: There is a danger in giving a press conference at this moment. Make sure you don’t make any statements that can lead to legal claims and only give away information that has been double checked.

Yes Community advisor: You will have to explain the community of Urbany and its surroundings why you made this decision. They have the right to know what were your considerations and what further risks you foresee.

Yes Economic Advisor: You will have to inform the people and certainly the management of the private sector in the county. They will have to be able to judge for themselves whether they need to evacuate. For some of the larger companies, evacuation will take more than a day and you will have to give them the option to evacuate or not based on their assessment of the potential damage to their production due to flooding.

No Political Advisor: For now, I would not go to the press. You commented a number of times in the recent past on the political debate on the creation of water retention basins and you asserted that these weren’t necessary for this area as sufficient measures had been taken to control the risk of flooding. At this moment in time you have other things on your mind than to be confronted with those political issues.

Dilemma 4: “Which area?”

Strategic commander: The upstream areas got flooded. The Dam is at its limits. We need to flood some more areas to prevent further damage.

The options are:

1. Open the locks next to the dam in a controlled manner as much as necessary and flood part of the city of Urbany and its industrial section. It is unclear how many inhabitants of Urbany will need to be evacuated.
2. Evacuate and flood areas further upstream, which includes the village of Settlement (approx. 6000 people) and the agricultural section of the county. Flooding the agricultural land will lead to a lot of contamination and loss of agricultural produce.

“Will you decide to open the locks?”

No Media advisor: It is unclear how many people in Urbany have to be evacuated and how much contamination is to be expected. Whatever you decide: you will have to communicate very clearly what and why you decided that this option is best. Probably best is to flood upstream.

No Legal advisor: Agricultural land matters and we do whatever we can with the means we have to make sure it is protected. However, rules from successive governments give the highest priority to lives and homes; and I think most people would agree that it is the right approach to flood upstream.

Yes Community advisor: Settlement has a strong community with an activist history. Last flooding, they put forward heavy criticism with regard to the handling of the crisis by the regional board, as the previous flooding left large swathes of the area under water for more than a month. The Settlement community has some strong links to national political parties. They already feel “set back” to Urbany.

Yes Political advisor: The village of Settlement has been sacrificed and flooded intentionally already two times in the past 20 years to spare Urbany from flooding. Their agriculture took a big blow and it took Settlement a long time to recover. The national government promised the Settlement community that this would not happen again as sustainable measure to mitigate floodings were to be taken. Hence, you can't break this promise to the population of Settlement.

No Economic advisor: Flooding Urbany will have big impact as it has a large industrial section and for most industries it is impossible to protect their machinery and stocks from flooding. This will evidently lead to foreclosure of quite a number of the industries and consequently to huge loss of jobs in Urbany.

Yes Technical advisor: If we don't open the locks in the dam in a controlled manner immediately, we run the risk of the doors breaking off and the water level in Urbany rising uncontrollably. This will go so fast that it will be impossible to evacuate the population before the water hits Urbany.

Dilemma 5: “Use civilians or not”

A lot of citizens offer their help. They offer to help to evacuate people and animals with their own means of transport. You could certainly use the extra capacity, but it is hard to control them. Your professionals will know what to do when the area gets flooded. On the other hand, if we don't use the help of the volunteering citizens at least a large share of the cattle and part of the Urbany may not be evacuated in time. Will you put the volunteering citizens to work?

The options are:

1. Putting the volunteering citizens to work.
2. Thanking the volunteering citizens and not use their offer to help.

“Will you put the volunteering citizens to work?”

No Media advisor: It will lead to a lot of questions whether our professionals are not capable of dealing with the situation.

No Legal advisor: It will lead to huge claims if we allow/ask citizens to endanger their lives.

Yes Community advisor: For the community it is good that they can be of help. Sending them away and not allowing them to do anything will get them frustrated. One consequence may be that they will start evacuating without any coordination.

No Technical advisor: Given the narrowness of the inner city, evacuation of the inner city of Urbany will be much faster if all people start walking right now and leave all their belongings behind. To allow the people to use the roads for walking, we have to keep all civilian vehicles out. Only professional services should be allowed in to make sure that people leave their houses, to help those that cannot walk and to control public order.

Yes Economic advisor: Of course you will have to allow volunteering citizens to help. They have so much more capacity and if you control that properly, so many more people, cattle and valuable produce can be rescued.

Dilemma 6: “Looting”

The toll of the flooding up until now is 12 people drowned and about 200 hospitalized and there are still mostly elderly people that haven't been able to leave their homes. While we are fully occupied with the rescue of people that are still in the inner city of Urbany and try to deal with the casualties, we have received strong indications that in the east area of the city people have started looting. Some people started to break into stores and now they are breaking into homes as well. They use fast boats to enter facilities and speed off again with valuables. The number of looters appears to be growing and the evacuated citizens are getting increasingly concerned.

As our resources are fully into rescue and clearing up. We might need to call for help and demand for the national guard.

“Will you ask for support from the army?”

Yes Media advisor: The citizens that have been evacuated are increasingly worried, you should call in the army. We demanded them to leave all their belonging behind and now these are being taken from them. They demand that the regional services act quickly, pursue these people with a vengeance and quickly bring those looters to justice, convict them with substantial sentences to set an example.

Yes Legal advisor: We required people to leave their homes and if we do nothing we let their houses being looted. We must act here, hence call the army.

No Community advisor: If you call in the army, they are likely to start looting themselves as most personal comes from very poor areas. The citizens are very worried to have large numbers of those people getting into their houses.

No Political advisor: Basically, up until now we have been able to handle the situation without the national guard and we are handling the aftermath properly. We said three years ago that we needed more funding for rescue services and we were awarded that funding. Now we can't call in the army as we should be able to handle this situation ourselves.

No Technical advisor: These looters basically seem to take food from stores. As they have no way of surviving otherwise, we shouldn't worry too much about them.

Dilemma 7: “Priorities”

Both areas got flooded after precautionary measures. We are now low on resources, but the water is receding. The people are looking at us for help with the recovery. The cattle are in meagre conditions as they were evacuated late, they were in the water for a while and had to be herded into an area with too limited

space. We have been notified that the drinking water there may be contaminated due to industrial pollution and that it is not sufficiently clean to use for the cattle. The area's economy has been affected heavily, business is losing collectively about 500000 euro per day.

The options are:

1. Clean/restore the economical/industrial area
2. Clean/restore the agricultural area

“Will you restore the economical/industrial area first?”

No Media advisor: It is likely that the media will get to the area where the cattle is now and will broadcast nationally about the poor condition of the cattle. The popular media are likely to pick this up as yet another case of mismanagement by the region.

Yes Legal advisor: There will be substantial claims by the businesses if the restoration of the economic sector will have to wait for the agricultural area to be restored first.

Yes Community advisor: Restore the economical/industrial area first so people can go to work.

No Economic advisor: The farmers have been suffering badly already in the past few years and many could not get any income-insurance any more after the previous flooding imposed to them to save Urbany. If we don't clean and restore the area right away, several of them will have to foreclose. The industrial area will suffer as well, but most companies have insurances and have the means to clean up and restore.

No Technical advisor: The cattle will not suffer too badly from being exposed during the flood, however measurements show that water in the area where the cattle is, is contaminated. If we leave the cattle there for more than four weeks they will probably not survive. My advice is to give priority to the cleaning of the agricultural area so that the cattle can return.

Dilemma 8: “Returning home”

With further rain expected following the wettest month on record in some places, saturated ground and high river levels could lead to further river flooding in the coming weeks. The question is whether it is sensible to let people that have been evacuated return to their homes. The risks for new flooding will continue to exist for a number of more weeks.

Many evacuees have gone to family, some have returned home illegally, but about 20000 persons are still packed on stretchers in cultural centres and sports facilities. People are protesting about the bad circumstances and the situation gets more and more stressed. People are pressing authorities to allow them to return home.

The options are:

1. Allowing people to return home and if necessary to evacuate again.
2. Trying to provide the evacuated population better shelter, even putting up people in hotels but not allowing them to return home.

“Will you allow people to return home?”

No Media advisor: We are now already 4 days on the front pages of the national newspapers. The images of our evacuees in cramped spaces on stretchers with no privacy whatsoever are like those of the refugee asylums. People protest and we have citations that the regional board is responsible for all this as they did not invest in flood detention and retention zones to accommodate excessive water. You cannot provide them with better shelter, so let them return home.

No Legal advisor: If the risks of new flooding are so substantial, you can't allow people to return to the area, we can't risk more loss of lives.

Yes Community advisor: People want to decide for themselves whether to return or not. If you inform them properly of the risks of new flooding, they will decide for themselves. Hence, I advise to allow them to return to their homes.

No Economic advisor: Providing better shelter is extremely costly and besides, the evacuated people cannot get to work and help with the reconstruction activities. The longer this takes, the more and more people will lose their jobs. My advice would be to allow people to return to their homes for now.

No Technical advisor: Basically, we cannot do anything that will help to mitigate the risk of new flooding. Also, the ground of the floodplains is so saturated that even lower water levels will cause flooding again. My advice would be not to allow people to return to the Urbany.

Answers to questionnaire

1. Content Scenario, Dilemmas, Advice

Below, we will first reiterate the original question, followed by the results in *italics*.

1. Was the scenario sufficiently realistic, if not, what was unrealistic?

19 out of 20 participants found the scenario sufficiently realistic.

2. Were the dilemma's sufficiently realistic, if not, what was unrealistic?

19 out of 20 participants found the dilemma's sufficiently realistic. The participant that said 'no' commented that the solutions for the dilemmas were entirely binary (yes/no). This was an issue that came up with several of the participants in the reflections. Some participants would rather come up with an option that wasn't available. The game format forces to make a decision and this is done intentionally so.

3. Was the feedback (newspaper article) sufficiently realistic, if not, what was unrealistic?

11 out of 18 participants said 'yes'. Some participants noted that the newspaper didn't seem to report positives and was a little bit cut and paste. Also, one participant said that he/she needed post-game discussion. Evidently, such discussion would be in the reflection part of the training. Others provided positive comments such as: 'yes, that is how the media works, I guess that it will be impossible to get an all one positive reaction.'

4. Were the dilemmas valid at the strategic level? If not which ones not, and why?

15 out of 18 participants said 'yes'. Others only commented. E.g. 'the dilemmas were valid, but I think there can be national differences concerning legal etc. which will make some of them more or less strategic.' 'Some dilemmas could have been clearer about the potential consequences.' 'Some of the dilemmas could have been clearer about the options, potential consequences but having 2 options was a good way of forcing a decision.'

5. Which dilemmas were particularly difficult and why?

Most participant found the dilemmas difficult enough, mainly because they were about sacrificing people and life and death. Below the remarks:

- *The sudden ... flooding upstream (to release the dam); choice of fewer deaths.*
- *Any involving loss of life.*
- *All were difficult.*
- *Whether or not to flood upstream-sacrificing lives, whether to restore city or agricultural land - not really clear what is the right answer.*
- *Dilemma's that involved uncertainty/about the effects of the options, as this left insufficient information to make an informed decision.*
- *The one where some people were always being put at risk.*
- *The one about opening locks.*
- *None.*
- *Flooding areas, allowing people to return, facing the media.*
- *All were proper dilemmas with unclear answers difficult to decide.*
- *The one that was the 'trolley problem' was easy. None were too bad.*
- *From a police perspective the dilemmas were; you could not be sure, that no lives were sacrificed.*
- *Whether to allow residents back into their houses or after evacuating them. You obviously want to allow them back into their homes but it involves a risk.*
- *Yes, 1) all people's lives matter, 2) whose lives do you put at risk? 3) media needs to play an important role by helping people escape safely, understand where to go.*

- *Between life and death, flooding kills old aged.*
- *Most were difficult, all had negatives so realistic.*
- *Who loses their lives to save others.*
- *The dilemma that was about sacrificing people.*

6. Which advisors did you find useful, which not?

Technical: 14 out of 18.

Economic: 7 out of 18.

Media : 7 out of 18.

Community: 6 out of 18.

Legal: 5 out of 18.

Political: 3 out of 18.

2. Process

1. Did your decisions sufficiently affect the course of events?

Few people answered this question right away. 4 said yes, 2 no, 3 not sure. Some participants stated that they believed so but couldn't be sure as they didn't know what results different decisions would have given.

2. Did the dilemmas invoke certain emotions, if so, which?

Many participants said that the dilemmas invoked certain emotions. The following emotions were reported:

- *Anger with media.*
- *Anxiety about the difficult choice.*
- *Concern.*
- *Feels insufficient.*
- *Frustration.*
- *Anger.*
- *Fear of making the wrong decision.*
- *Conflict.*
- *Worried.*
- *Stress.*

3. Did you experience a double bind? If so, which double binds (advisors giving conflicting information) were particularly difficult and why?

Five participants answered 'no'. A few participants answered there as a conflict regarding lives or the economy. Other answers were:

- *There was conflicting safety advise.*
- *Many.*
- *The press-conference was a clear lose-lose situation.*
- *The flood/not flood arguments.*

3. International context

1. Was the content of the training sufficiently realistic given your national crisis management system (e.g. legal and organization setting)? If not, what parts weren't

Very few participants actually answered this question. 3 participants said yes, 2 said 'not sure' and some others just commented e.g. 'in some ways easy as we were faced with clear choices, sometimes decisions may be more complex'.

