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Deliverable D3.4:
Briefing papers and summary for the workshop

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INTRODUCTION

This deliverable provides an outline of the FORTRESS workshop for external stakeholders that took place on 10 April 2015 in London. The purpose of the workshop was to gather feedback on the tools and models being developed as part of the FORTRESS project. On the next pages, it lists the agenda for the meeting, the background of the participants, a summary of relevant FORTRESS research provided to external participants, and the key outcomes of the workshop.

WORKSHOP AGENDA

Introduction

09:30 – 09:50 Welcome (UCL) & Introduction to FORTRESS – TUB

09:50 – 10:45 Conceptual introduction to the FORTRESS Scenario Builder (FSB) and FORTRESS Incident Evolution Tool (FIET)
Session facilitator: Leon Hempel/Robert Pelzer Technical University Berlin (TUB)
Introduction to the network-oriented modelling approach underlying the FSB and FIET. It will be illustrated how these models can be used during a crisis situation as a foresight and analysis tool that make the invisible visible in a crisis situation and thus provide support for decision-making. The added value the FORTRESS tools could have for training based on scenario exercises is explained.

Presentation of mock-ups of the first versions of the FSB and FIET

11:00 – 12:30 Session 1: Functionality of the FSB and FIET
Session facilitator: Rob Peters & Gerke Spaling- Institute Physical Safety (IFV)
In this second session we move away from the model of sequential training for crisis response. By adding 'dynamic' data to the crisis models, unforeseen features are brought into crisis scenarios, which then need to be addressed in the response to crises. For example, in managing the consequences of rising water levels in rivers, the issue of relocating heavy river-traffic is added to the scenario. By adding commonly unanticipated aspects of a crisis new connections and actors (for example shipping agencies owning container ships.

13:30 – 15:00 Session 2: New and unforeseen relationships in crises
Session facilitator: Alberto Olmo Fernandéz, Treelogic & José Luis Benito, GMV
The first mock-ups of the FSB and FIET will be presented. These consist of maps of crisis-affected areas and present the workshop participants (predominantly silver crisis responders) with choices that they may have to face depending of the different issues they may or may not come up during a crisis. This session uses maps and materials from past crisis situations to make workshop participants familiar with the functionality of the FSB come into play, new types of situations are created, and various paths of cascading effects should be considered.

Discussion

15:15- 16:15 User feedback
The last part of the workshop consists of a discussion on what the workshop participants think of the FSB. This is centred on the question 'Can a tool such as the FSB help in the daily process of training and preparation?'

EXTERNAL PARTICIPANTS

The workshop was attended by seven external participants that belonged to a range of civil protection and crisis management organisations from across Europe. There was a representative from the Metropolitan Police of Turin, Italy and two Safety Advisors (one representing industrial safety and one for physical safety) from Safety Region Twente, a municipal authority for civil protection in Netherlands, as well as a risk manager from this organisation. A retired Police Officer responsible for gold level command and control in the UK was also present, along with a Command and Control Consultant from London, engaged in developing public sector response to crises. Also in attendance was an Emergency Manager from the city of Antwerp in Belgium. All of the external participants had directly participated in managing responses to crisis situations, and could be considered experts and practitioners in the fields of emergency planning, response, and management.

OVERVIEW OF RELEVANT FORTRESS RESEARCH PROVIDED TO EXTERNAL PARTICIPANTS

The two sub-sections below present the text sent to the workshop participants prior to attending the workshop.

ABOUT THE FORTRESS PROJECT

Cascading effects in crisis situations refer to the sequence of events in a crisis resulting in physical, social or economic disruptions far beyond the initial impacts of the crisis. The analysis of cascading effects, and the identification of their triggers, can contribute to enhancing the understanding of the complexity of cascading crisis situations, which can in turn aid in addressing cascading effects. The FORTRESS (Foresight Tools for Responding to cascading effects in a crisis)[1] project aims to improve crisis management practices by identifying the diversity of cascading effects and using this to develop tools to assist decision-makers in preparing and training for crises with cascading effects.

BACKGROUND RESEARCH FEEDING INTO THE WORKSHOP

The work on the FORTRESS project is split up over ten so called 'Work Packages', each with their tasks and associated reports or 'deliverables'. This paper and the workshop on the 10 April 2015 in London are related to Work Package 3 "Reconstruction of crises and crises decision processes". In particular, the workshop will draw on Deliverables 3.1 "Historical case studies of cascading crisis" (Hagen et al., 2014) and Deliverable 3.2 "Map of stakeholder inter-relationships and ecosystems" (Hagen et al., 2015).[2] The work in Work Package 3 started with Task 3.1 (which produced Deliverable 3.1), in which nine historical crisis case studies were analysed with regards to their cascading effects. The selected crises were the Enschede fireworks factory explosion (2000, the Netherlands), the London attacks (2005, UK), the Fukushima nuclear disaster (2011, Japan), the Galtür avalanche disaster (1999, Austria), the European Heatwave (2003, focus on France), the MH17 plane crash (2014, Ukraine), the Eyafjallajökull volcanic eruption (2010, Iceland, but with a focus on the UK), Hurricane Sandy (2012, USA), and the Central European floods (2002, focus on Prague).

Each case study used visual representations to outline the sequence of events during the crisis, the time scale of the event, what actions in crisis management were carried out, the direct negative effects, and the sectors indirectly affected. Colour coded lines and arrows were used to indicate relations and connections between these categories and sectors, and triggers of cascading effects were identified and classified using a common categorisation system for all case studies.

An analysis of the results revealed three main categories of triggers that were common across all nine case studies. The first category concerned a disruption of relations that should have been functioning at the time of the crisis, including the disruption of information relations, organisational relations, and supply relations. The most widespread disruption was a loss in capacity or breakdown of information relations resulting from the congestion of telecommunication networks during crisis situations. This resulted in delays in crisis management and difficulties amongst crisis managers, crisis responders, and between these groups and the public. This also affected organisational relations (connections between

[1] FORTRESS has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 607579.
[2] Copies of both deliverables are available on the project website: http://fortress-project.eu

stakeholders involved in the crisis management), which were seen to suffer disruptions due to flaws in decision-making structures, organisational capacity, or crisis management. Such organisational weaknesses were seen to create confusion over management roles and responsibility, and often led to decision-making that was erroneous and/or triggered additional events that compounded the crisis. The disruption of supply relations related to the provision of common goods and services, such as the supply of water, which may be affected during and after the onset of a crisis.

A second category of triggers was identified as disturbance relations, or relations of dependency that do not exist in normal circumstances, but emerge only during the onset of a crisis. For example, the failure of the cooling pumps in the Fukushima nuclear power plants led to the engagement of the fire service to cool the reactors. However, a lack of pre-existing knowledge and capacity in the fire service to deal with such a situation only served to compound the crisis further.

The last category of triggers related to the existence of pre-disaster conditions concerned with developments and events taking place prior to the crisis, and that led to cascading effects during the crisis. These can range from general social and cultural attitudes to risk, or specific decisions taken at a governmental level that produce gradual changes in the behaviours of citizens. For example, the 2002 floods in Prague clearly illustrate how political decisions led to changes in settlement patterns, increasing citizens' exposure to floods, and subsequently contributed to the destruction of homes, goods and commercial properties during the flood event.

Overall, an analysis of the triggers of cascading effects identified in all nine case studies revealed the following main findings:

- Triggers of cascading effects can have their roots both in the turn of events during crises, as well as in a pre-crisis context. The latter implies that crisis preparedness cannot be viewed in isolation from the everyday life in a given society, country, or area.

- Regulations and sanctions in a pre-crisis stage have the potential to reduce cascading effects in a crisis. However, the effectiveness of such regulations is dependent on how they are implemented and whether those subject to the regulations comply with them. Compliance is not only the responsibility of those being regulated, but also of the regulator.

- Pre-crisis conditions, such as economic and political developments, contributing to cascading effects are more difficult to address by the means of preparedness measures. Triggers related to pre-crisis conditions are frequently linked to gradual changes over long periods of time and can rarely be pinned down to one single event or cause.

- With regards to triggers that originate during a crisis, having separate communication systems, as well as pre-established plans of approach and clear divisions of responsibilities, could improve the organisational response to crises. This could considerably reduce the cascading effects related to the disruption of information and organisational relations, as well as those related to disturbance relations.

- Cascading effects are not merely related to flaws in interdependent infrastructure systems, but can be a result of various other factors such as human errors or a lack of

resources. In addition to physical or material solutions, strengthening human resources plays a considerable role in planning for emergencies with the aim of reducing cascading effects.

The historical case studies also revealed that cascading effects in crises are rarely the result of a turn of events that exist in isolation. Their impacts are usually the result of a web of relations and dependencies between and amongst actors and systems. In order to explore this further, Task 3.2 of Work Package 3 examined these connections based on an analysis of the case studies. The findings of Task 3.2 are presented in Deliverable 3.2 (Hagen et al., 2015), which begins by mapping relations between two predefined nodes: the sectors impacted during each individual crisis, and the physical causes of these impacts. This analysis demonstrated that there are several types of connections between nodes, of which some occur more often than others. The most commonly observed connections are those regarding direct physical impacts leading to indirect impacts that occur during a crisis situation. Other relations between nodes concern direct physical impacts linked to indirect impacts that occur after the crisis, and relations in which direct physical impacts are absent, but that are nevertheless characterised by impacts of a more indirect nature that occur during the crisis.

The report then identified actors involved in responding to each crisis, and described how they relate to one another based on the disaster management structure that was in operation at the time of the crisis. Communication and decision-making were identified as key elements in these relations, regardless of whether structures set out for communication and decision-making were adhered to or not. Subsequently, the findings detail characteristics and aspects of organisational relations between actors involved in crisis management. Whilst there was no uniform approach adopted with regard to terminology for describing elements of organisational relations, coordination and decision-making stood out as the central elements in crisis management. Along with the other identified elements (communication, advice, operation, planning, command, and information), these elements of crisis development will be used to build tools – the FORTRESS scenario builder and the FORTRESS Incident Evolution Tool to aid decision-makers in reducing cascading effects. Preliminary ideas and versions concerning these tools will be the main focus of the FORTRESS Workshop in London (10 April, 2015).

The FORTRESS London Workshop (10/04/2015) will discuss these tools which are being developed using the abovementioned findings to provide support to decision-makers and crisis responders prior and during crisis events. It is hoped that these models can be used during a crisis situation as a foresight and analysis tool that make the invisible visible in a crisis situation and thus provide support for decision-making. The project organizers welcome feedback and input into the development of these models from external participants who have knowledge and experience of preparing for or managing crisis situations.

KEY OUTCOMES

The workshop was intended as a means of obtaining input and feedback from external participants into the FORTRESS Incident Evolution Tool (FIET) and the FORTRESS Scenario Builder (FSB) tools being developed under the FORTRESS project. There were several main outcomes of the meeting, emerging around the need to streamline and focus the utility and interplay of both tools.

The first outcome pointed to a need for clarifying the targeted users for each of the tools. Based on the feedback from external participants, the FIET would be of greater interest to first responders, whereas infrastructure institutions might have a different perspective on the utility of the tools. Hence, project partners need to take into account that different user groups will have different requirements from the tools (e.g., first responders vs. infrastructure institutions). It is not sufficient to have a general tool aimed at all audiences, so the tool will have to be targeted at two different groups:

- First responders that would be interested in the decision-support capacities of the FIET, both on a generic level and a detailed level (if available).

- Infrastructure providers that would be interested in the relations-building capacities of the FSB; however they might also be interested to test their dependencies in a variety of different scenarios and thus benefit from the shared knowledge that would have been established.

The second key outcome addressed the scope of both the FIET and FSB tools. There was a lengthy discussion regarding to the level of data aggregation (generic vs. specific) and the situations (crisis vs. pre-crisis) to be covered by both tools. The end users' feedback was very clear about this issue in that a reduction of some functionalities would be worth fewer but better functioning features. A tool that could provide some insights on a generic level (raising awareness of relations between infrastructure X and Y) and specific (sub-system of infrastructure X and sub-system of infrastructure Y) would be welcomed by most crisis managers, and would already be seen as quite an achievement, while the idea of providing live decision support during a crisis at a very specific level (hospital X will run out of power in Y hours in the case of event A) was seen as very hard to achieve and implement. Therefore it was discussed that the overall objectives of the tools should:

- Make visible the invisible before a crisis happens: help end-users to identify interconnections between systems/sub-systems, raise awareness of interconnections and related 'generic risks';

- Display interconnections and possible cascades during crisis, and;

- Establish relationships and a joint knowledge-base that fosters inter-organisational communication during crisis.

Other discussions centred on the temporal scale of crises, and the need to consider the importance of timeframes when constructing scenarios and models. The participants also pointed out the need to focus on the pre-crisis stage as a means of assisting decision making during crises. The role of citizens, and their representation in the models was also considered to be a subject of importance when building these tools. Last but not least, the issue of how

such tools could be deployed on an operational level was also debated. The exercise provided an extremely useful opportunity for the exchange of ideas between project partners and practitioners working in emergency management, and will be the basis of building tools that are more grounded and effective in addressing the needs of end users.

REFERENCES

Hagen, K., Watson, H., Wadhwa, K., Anson, S., Tzanetakis, M., Kreissl, R., Ritchey, T., Zaidi, Z., Pescaroli, G., Alexander, D. 2015. Map of stakeholder inter-relationships and ecosystems. *Deliverable 3.2 of the FORTRESS project.* http://fortress-project.eu/research/ (Accessed: 17 February 2015).

Hagen, K., Watson, H., Wadhwa, K., Tzanetakis, M., Kreissl, R., Pescaroli, G., Alexander, D., and Ritchey, T. 2014. Crisis case studies of cascading and/or cross-border disasters. *Deliverable 3.1 of the FORTRESS project.* http://fortress-project.eu/research/ (Accessed: 16 February 2015).