FP7 2013 Cooperation Work Programme
Theme 6: Environment (Including Climate Change)

Novel indicators for identifying critical *INFRA*structure at *RISK* from Natural Hazards

Deliverable D9.5

Training Course Provision

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Executive Summary

This deliverable describes a series of sample training videos that were produced within the INFRARISK project that present the various methodologies and tools that were developed in the project. These training videos have the potential to be employed as part of a training course to inform infrastructure owners and managers about how to perform stress tests for critical road and rail networks due to extreme natural hazard events. Four sample training videos were produced, which are available on the INFRARISK website (https://www.infrarisk-fp7.eu/) and the INFRARISK YouTube channel (https://www.youtube.com/channel/UCK4VKDQzosT7FwgDtaSRWiA/videos).

The sample training videos cover the following topics:

1. Introduction to INFRARISK
2. Stress Test Framework
3. INFRARISK Decision Support Tool – Italian Case Study
4. Objective Ranking Tool – Croatian Case Study

These sample training videos consist of imagery, interviews, voiceovers, demonstrative slides and interactive examples.

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1.0 INTRODUCTION

To enable critical infrastructure managers and owners to implement the stress test framework that has been developed in the INFRARISK project, a series of sample training videos were produced. The intention was to disseminate the methodologies and tools that were developed in the project. The videos may also be used in a classroom environment to inform infrastructure managers and owners of the novel methodologies that have been developed in the INFRARISK project, as well as the tools that are available to them.

Four sample training videos were produced. Training video 1 provides an introduction to the INFRARISK project and describes the potential impact of extreme natural hazard events on road and rail infrastructure. Training video 2 describes the framework proposed in the project to conduct stress tests according to the overarching risk assessment methodology. Training video 3 introduces the INFRARISK Decision Support Tool (IDST); a software tool that was developed in the project to enable users to perform their own stress tests. One of the case studies examined in the project that consists of a road network in northern Italy is presented in this video according to the IDST. Finally, training video 4 presents the Objective Ranking Tool (ORT), which is a web-based multi-user application that can be used for decision making. The video describes the application of the ORT to another case study that was conducted in the project, which consists of a rail network in Croatia.

This report describes the development of the sample training course that was conducted by the INFRARISK project partners: Roughan & O'Donovan and PSJ Consulting with input from Probabilistic Solutions Consult and Training, ETH Zurich, and IT Innovation at the University of Southampton. All videos were produced by Dragados SA. A brief overview of each of the sample training videos is provided in this report to enable users to access the required information. The training videos may be accessed via the INFRARISK website (https://www.infrarisk-fp7.eu/) and are also available on the YouTube channel (https://www.youtube.com/channel/UCK4VKDQzosT7FwgDtaSRWiA/videos), providing a critical infrastructure training resource to the global community.

2.0 OVERVIEW OF TRAINING VIDEOS

Each of the sample training videos commences with the same introductory content, which consists of an interactive view of the INFRARISK logo (Figure 2.1) and an acknowledgements page (Figure 2.1).

Figure 2.1: Introductory video logo

Figure 2.2: Introductory video acknowledgements

A brief overview of the four sample training videos is presented in subsequent sections. In each case, an explanation of the content, as well as sample imagery is provided.

2.1 Training Video 1

Training video 1 provides an introduction to the INFRARISK project. This includes a description of the motivation for the project, which outlines the potentially devastating consequences of natural hazards in terms of critical infrastructure damage. In addition, some statistics relating to natural hazard past events are presented.

Figure 2.3: Video 1 – Impact of natural hazards on critical infrastructure

A description of the European TEN-T network and its importance is subsequently provided (Figure 2.4), which is considered as critical infrastructure in the INFRARISK project.

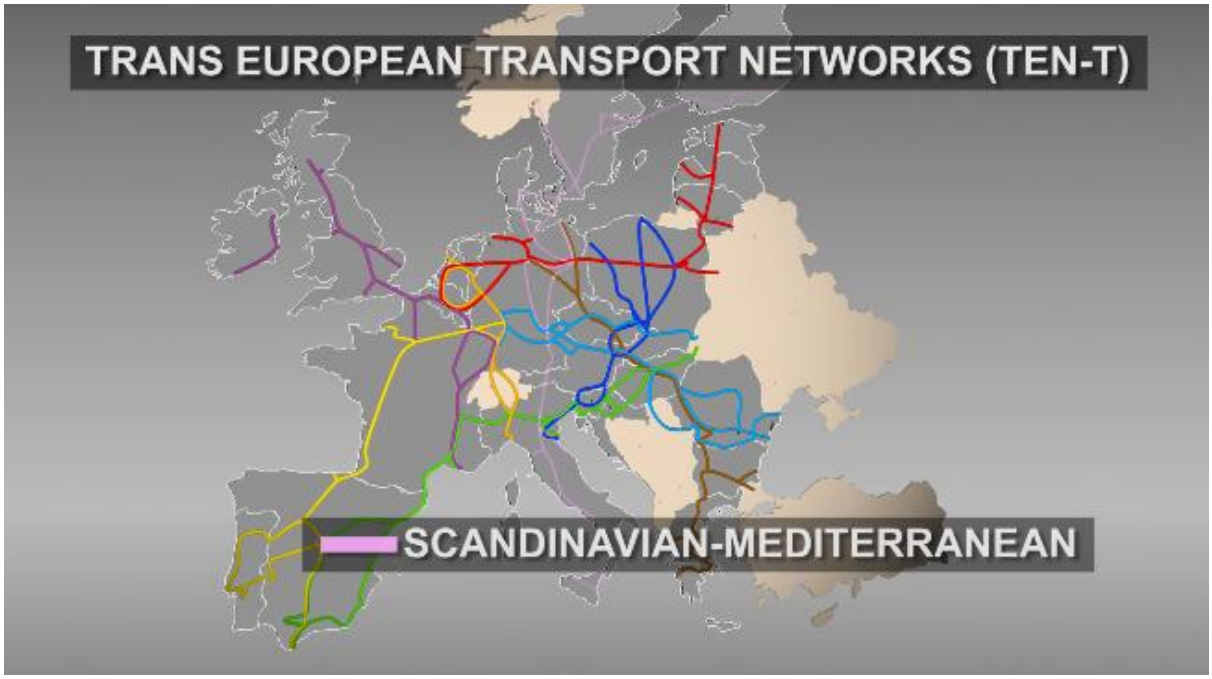

Figure 2.4: Video 1 – TEN-T network

An interview with the project coordinator, Prof. Eugene OBrien, is subsequently presented (Figure 2.5). Prof. OBrien describes the INFRARISK project consortium, the scope and aims of the INFRARISK project, as well as the objectives and benefits associated with the performance of stress tests for critical road and rail infrastructure due to natural hazards.

Figure 2.5: Video 1 – Project Coordinator

Prof. OBrien also describes the main outputs of the INFRARISK project, such as the stress test framework (Figure 2.6), the IDST and the selected case studies.

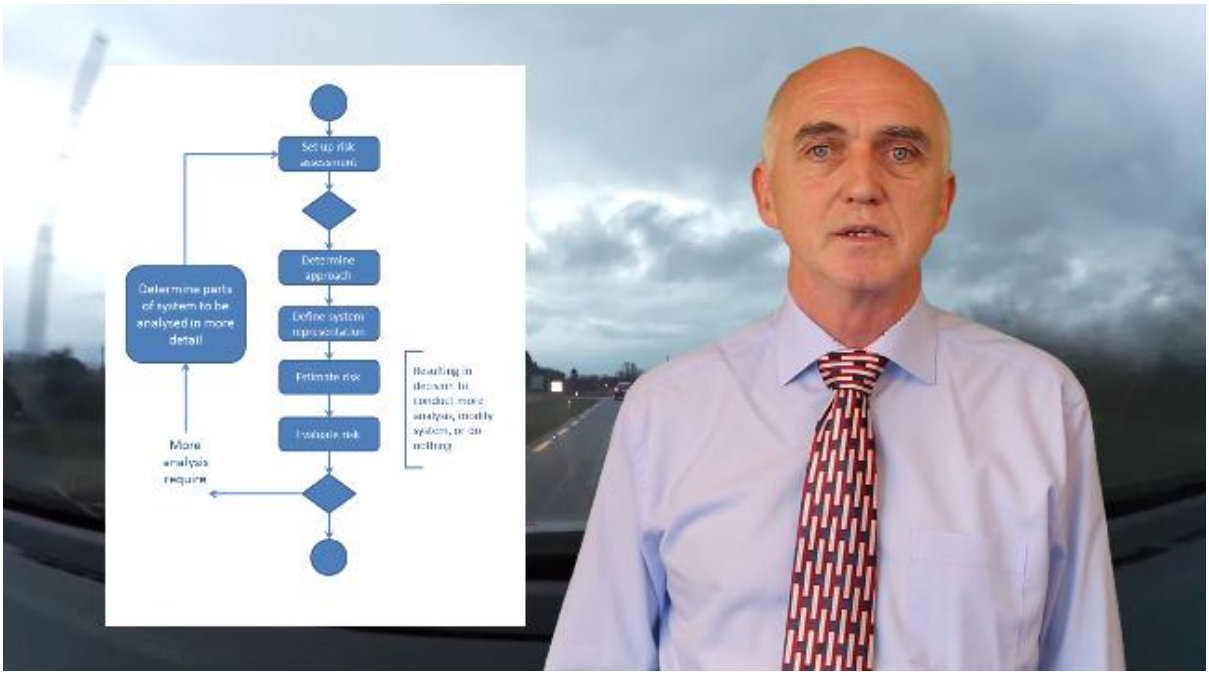

Figure 2.6: Video 1 – Overarching risk assessment methodology

The next section of this video describes the hazards that are considered in the project, as well as the type of infrastructure examined and methods of network vulnerability assessment (Figure 2.7).

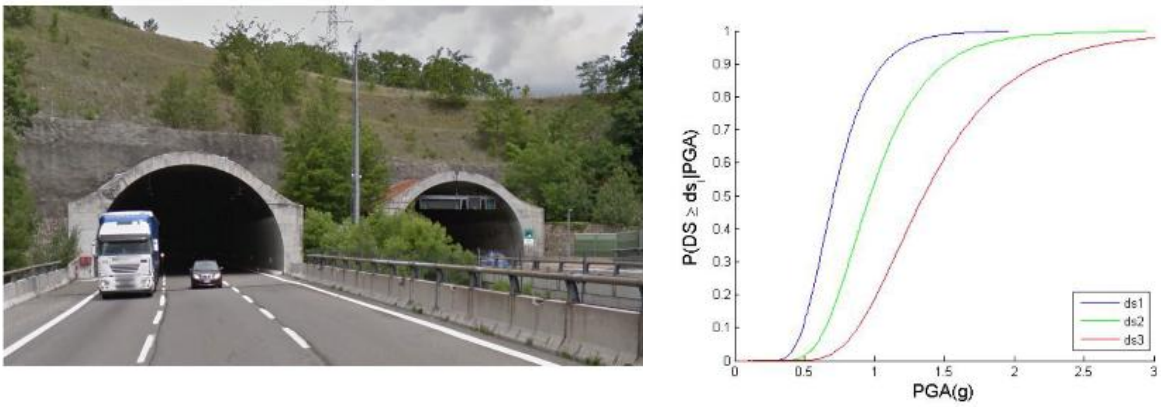

Figure 2.7: Video 1 – Infrastructure elements

The video also describes some of the methodologies that have been employed in the project to consider the spatial and temporal variation of distributed transport networks and the associated natural hazard occurrences (Figure 2.8). In addition, the two case studies that have been analysed in the project are introduced (Figure 2.9).

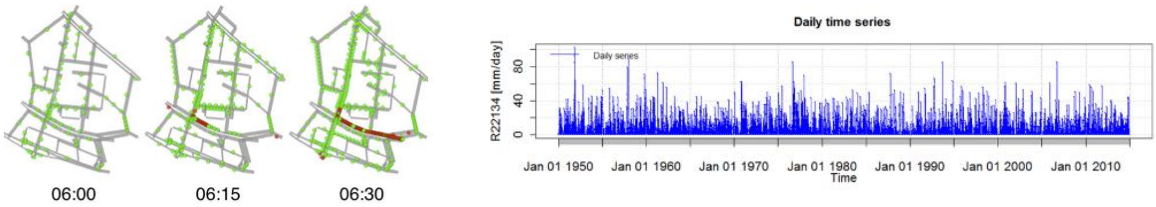

Figure 2.8: Video 1 – Spatial and temporal effects

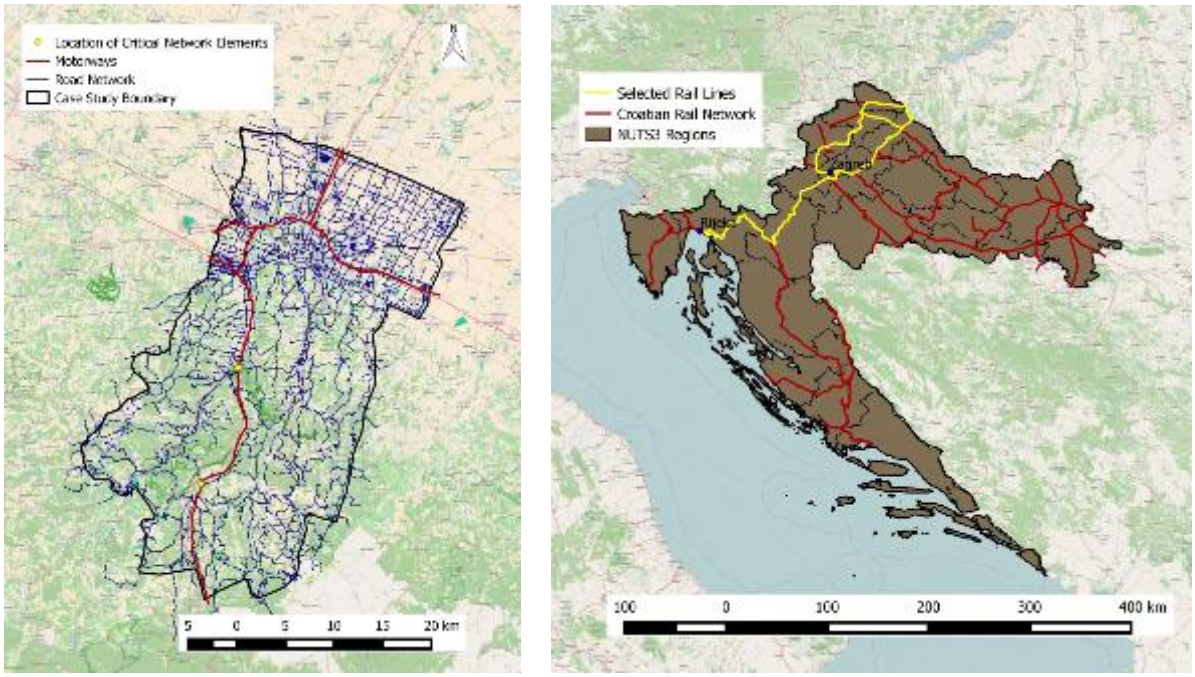

Figure 2.9: Video 1 – Case studies

The online tools developed in the INFRARISK project, namely the IDST and the Knowledge database are subsequently described (Figure 2.10).

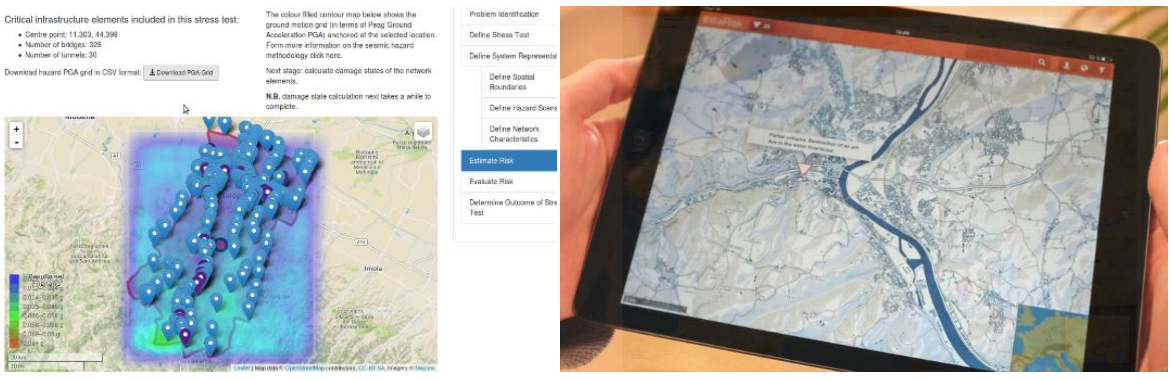

Figure 2.10: Video 1 – Online tools

Finally, the content of the subsequent three training videos is briefly described (Figure 2.11) and further information in relation to the project is provided (Figure 2.12).

Figure 2.11: Video 1 – Description of training videos

Figure 2.12: Video 1 – Additional project information

2.2 Training Video 2

Training video 2 is composed of two parts. In the first section, the overarching risk assessment methodology proposed in the project (Hackl et al., 2016) is presented, which can be used to assess infrastructure related risks due to natural hazards. The video is presented as a series of presentation slides along with a voiceover that describe where and why such an approach may be adopted (Figure 2.13).

Figure 2.13: Video 2 – Problem statement

The individual tasks associated with the proposed methodology are presented (Figure 2.14). Each task is subsequently described in detail, whereby examples of how it can be applied to an infrastructure network in practice are presented (Figure 2.15).

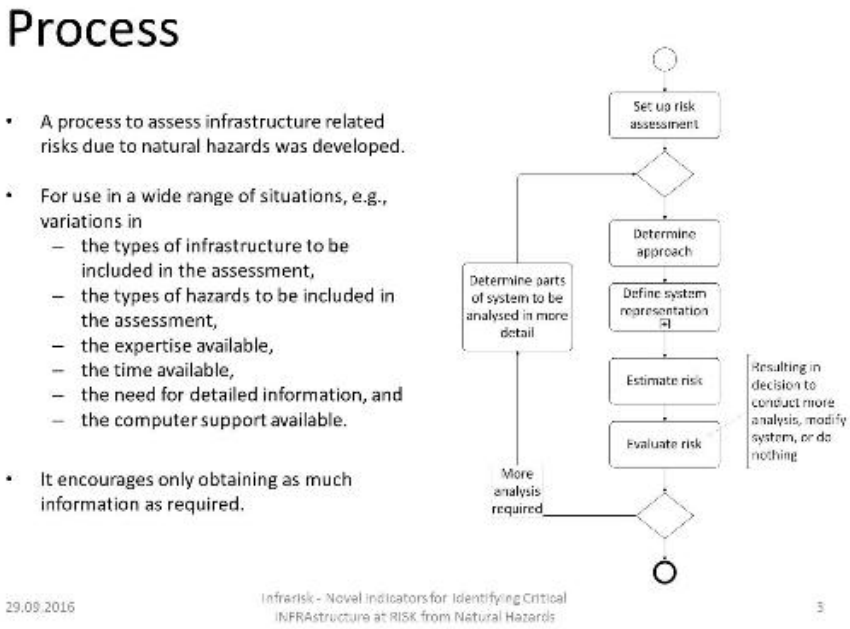

Figure 2.14: Video 2 – Overarching risk assessment methodology

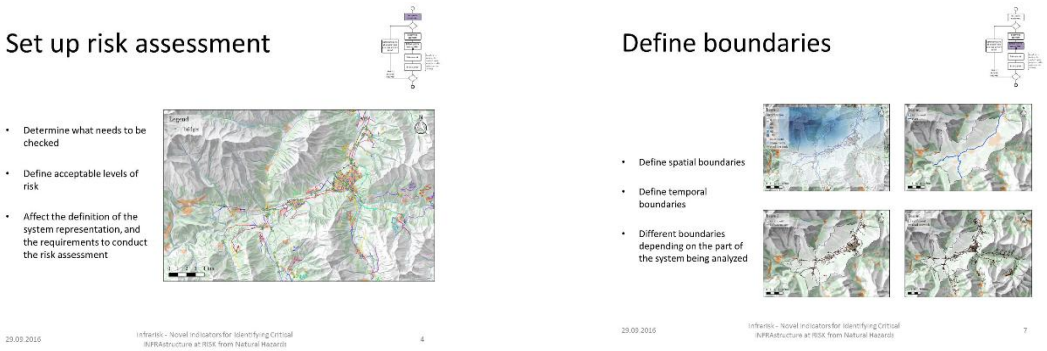

Figure 2.15: Video 2 – Sample risk assessment tasks

The second part of this video presents concepts of the INFRARISK stress test framework (van Gelder and van Erp, 2016) are presented. Similar to part 1, this section of the video consists of a series of presentation slides with an accompanying voiceover. The definition of 'stress tests' as they relate to infrastructure networks is presented (Figure 2.16).

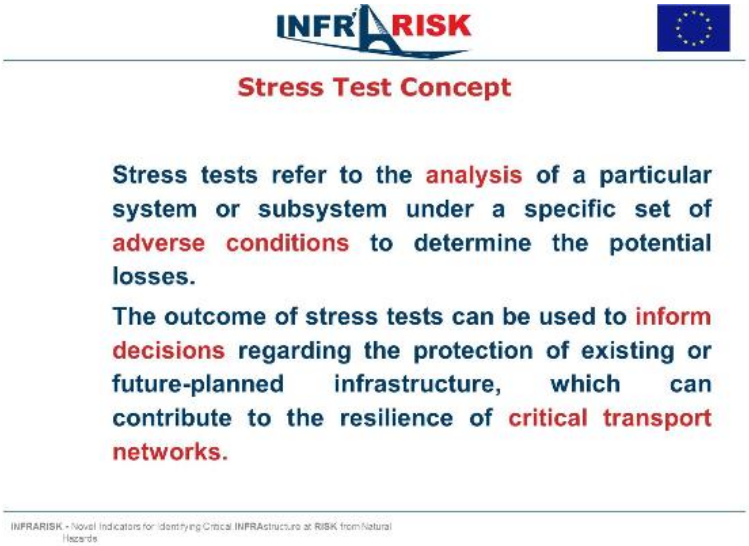

Figure 2.16: Video 2 – Definition of stress tests

Guidelines are also provided in relation to the follow aspects of stress testing for infrastructure networks (Figure 2.17):

- selection of stress test scenarios;
- spatial mapping;
- probability mapping;
- damage state scenario selection;
- outcome estimation;
- decision making.

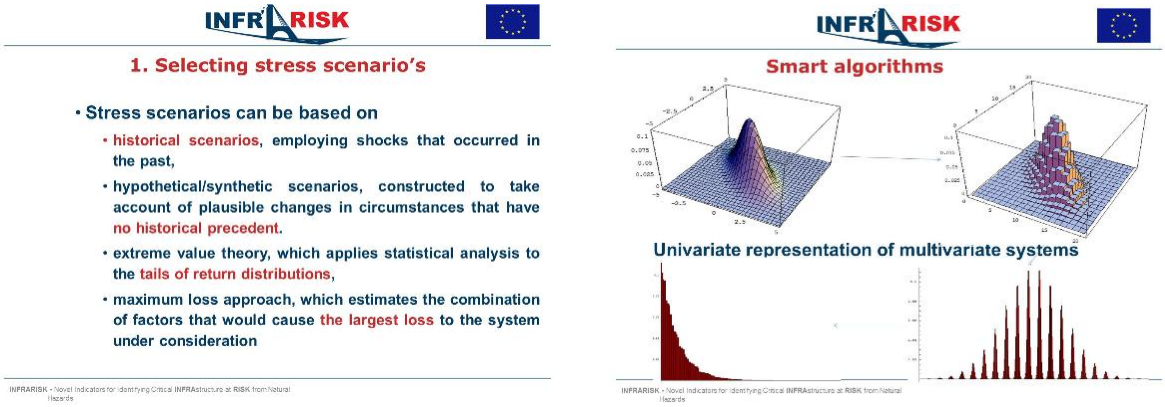

Figure 2.17: Video 2 – Sample components of stress test framework

2.3 Training Video 3

Training video 3 presents the INFRARISK Decision Support Tool (IDST), which can be used by infrastructure managers and owners to perform stress tests for road and rail infrastructure network to evaluate the impacts of low probability high consequence natural hazard scenarios. The video presents an interactive example of the Italian case study that was conducted in the INFRARISK project (Clarke et al., 2016).

The video provides the web address and introduces the IDST (Figure 2.18).

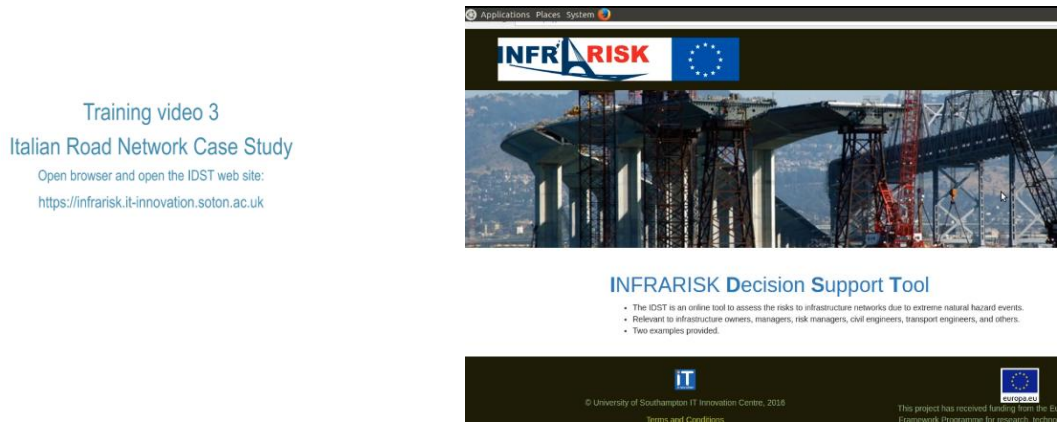

Figure 2.18: Video 3 – IDST web address

Viewers are subsequently guided through the IDST according to the Italian case study example. Information is provided in relation to user login (Figure 2.19) and online information in relation to the overarching risk assessment methodology proposed in the INFRARISK project (Figure 2.20).

Figure 2.19: Video 3 – IDST user login

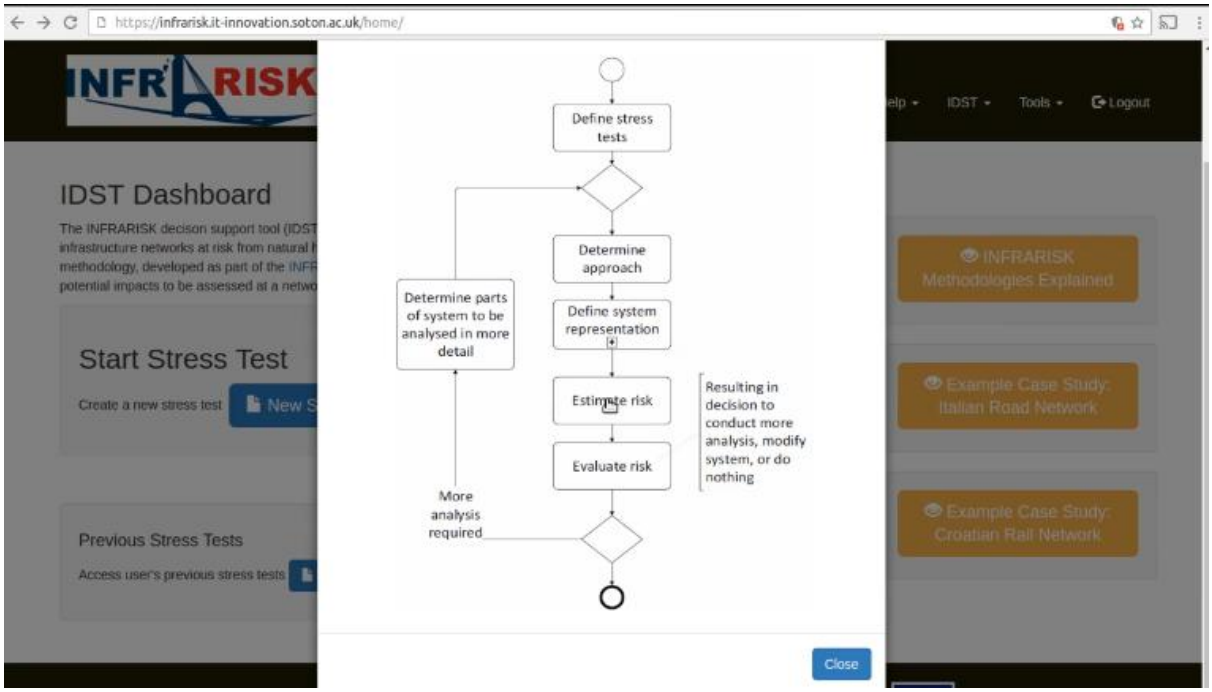

Figure 2.20: Video 3 – IDST user login

Additionally, viewers are shown how to initiate a new stress test (Figure 2.21).

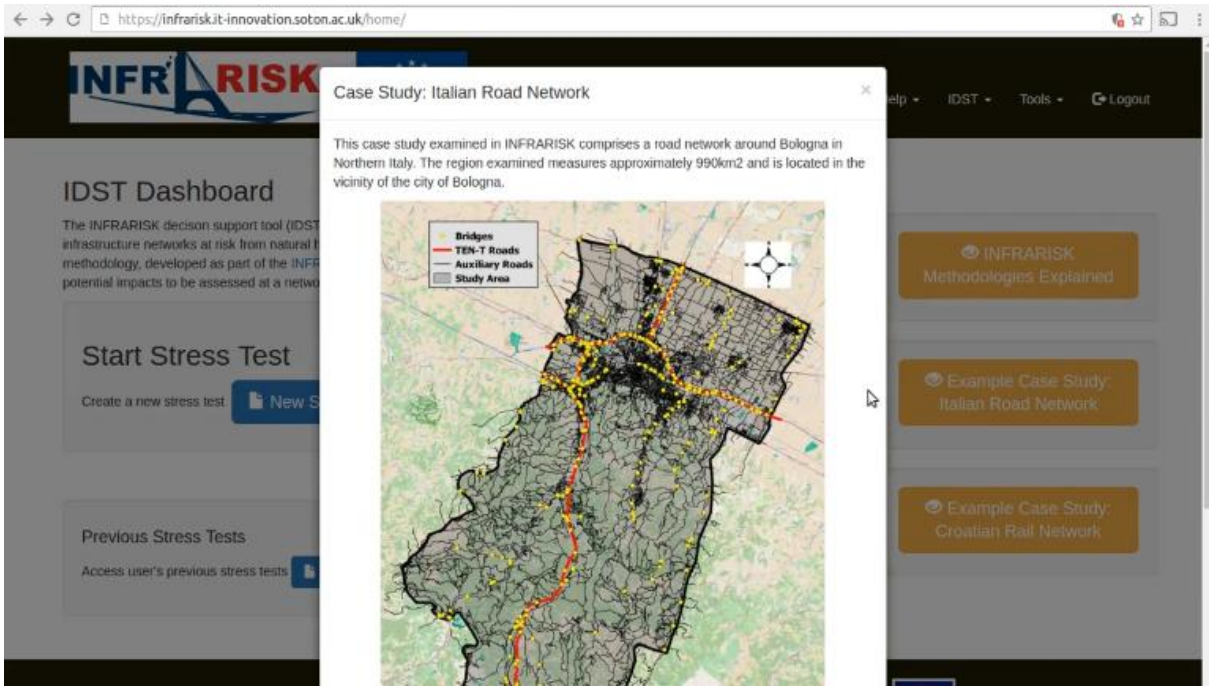

Figure 2.21: Video 3 – IDST user login

The video subsequently guides the viewer through the IDST according to the Italian case study example according to the tasks defined in the overarching risk assessment methodology (Hackl et al., 2016), as shown in Figures 2.22 and 2.23.

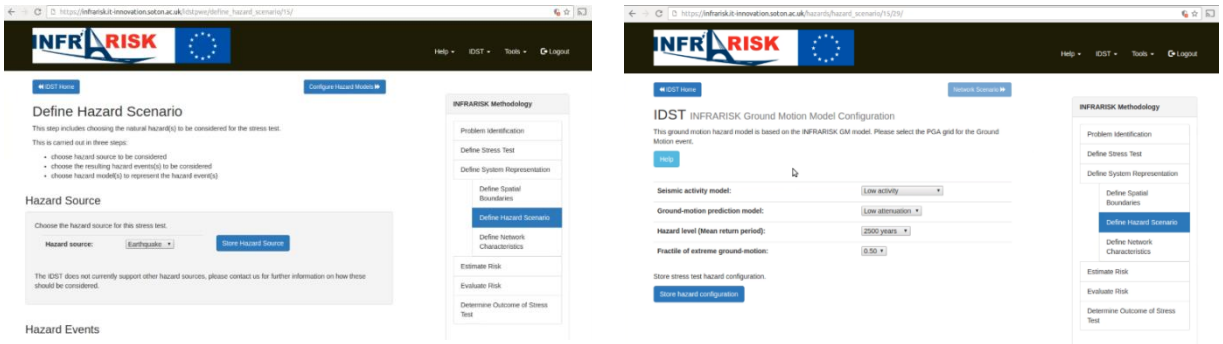

Figure 2.22: Video 3 – IDST showing Italian case study example

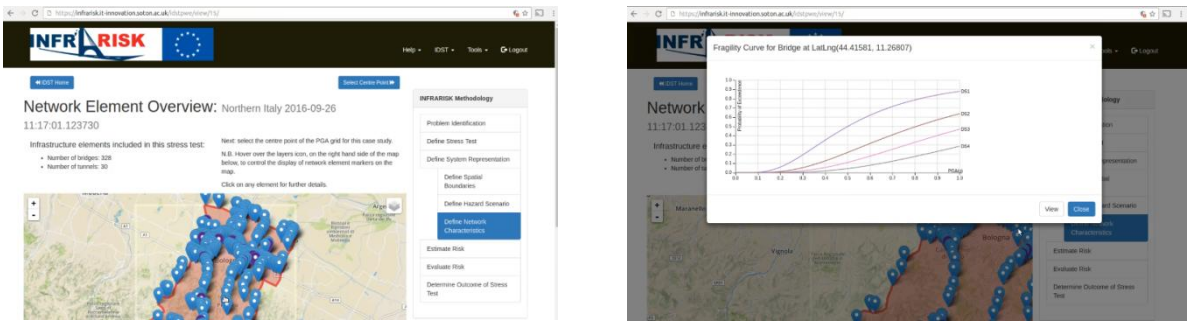

Figure 2.23: Video 3 – IDST showing Italian case study example

2.4 Training Video 4

Training video 4 introduces the Objective Ranking Tool (ORT) and demonstrates the application of this decision making approach to the Croatian case study that was conducted in the project (Clarke et al., 2016). The video consists of a series of presentation slides that describe the theoretical principles that underlie the ORT (Figure 2.24).

Figure 2.24: Video 4 – Theoretical principles of ORT

Viewers are subsequently guided through the ORT application for the Croatian case study, in which the rail network was ranked according to the associated risk due to extreme flood hazard scenarios (see Clarke et al., 2016). The video presents details of the web address for the ORT online application as well as user login details (Figure 2.25).

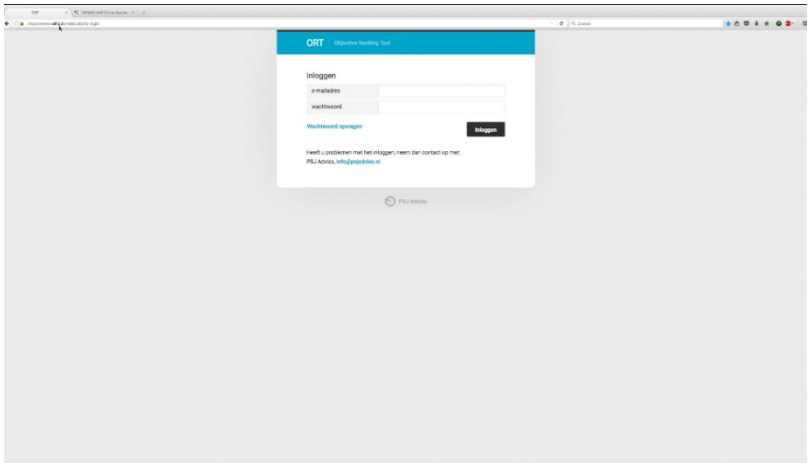

Figure 2.25: Video 4 – ORT user login

The video subsequently guides the viewer through the criteria that were users to assess individual rail sections (Figure 2.26).

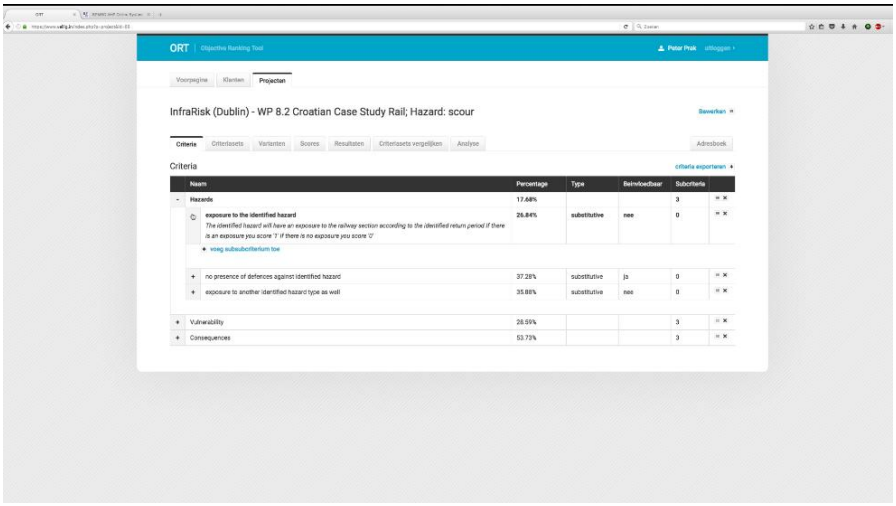

Figure 2.26: Video 4 – ORT evaluation criteria

Viewers are subsequently shown how to score individual rail sections (Figure 2.27) and the results of the ORT application for the Croatian case study are subsequently presented (Figure 2.28). The benefits of the ORT application for infrastructure managers or owners are also highlighted.

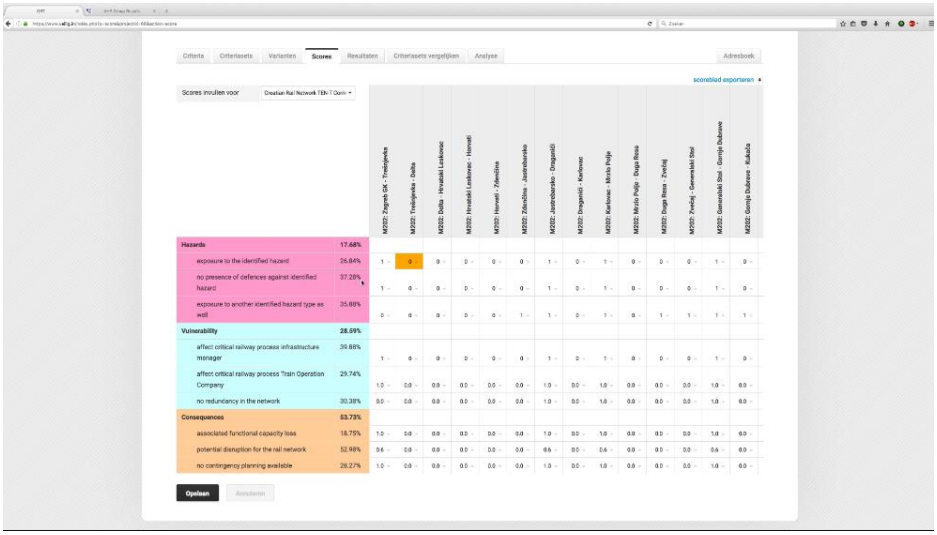

Figure 2.27: Video 4 – ORT scoring

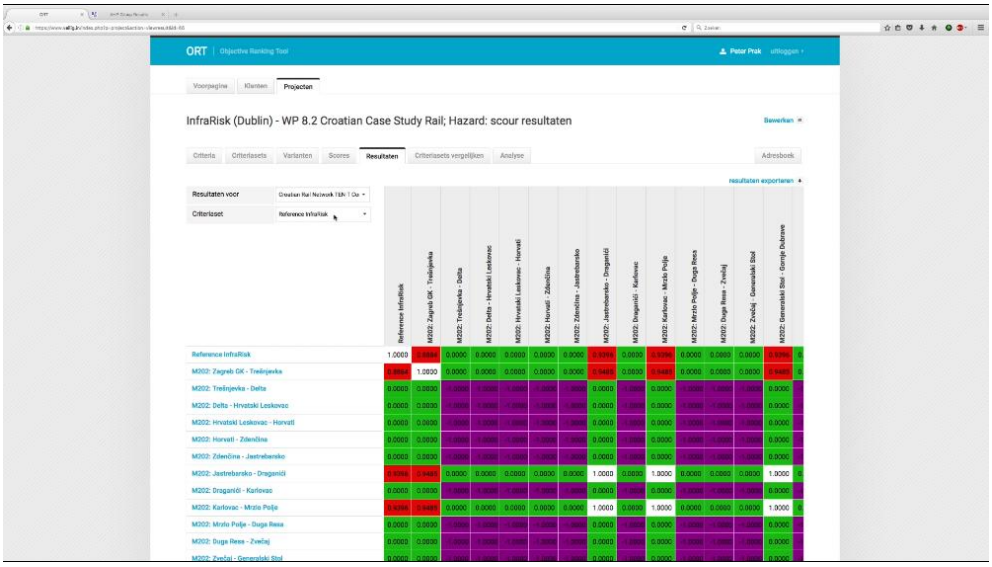

Figure 2.28: Video 4 – ORT results for Croatian case study

Finally, a recap of the sample training videos that are available in this training course is presented (see Figure 2.11).

3.0 CONCLUSION

This report has provided a description of the sample training videos that have been produced in the INFRARISK project. These videos may employed as part of a training course in a classroom or online learning environment to inform infrastructure managers and owners of the main outputs of the INFRARISK project, which can be used to assess the risk to critical road and rail networks due to extreme natural hazard scenarios.

The training course consists of four sample training videos. Training video 1 provides an introduction to the INFRARISK project and describes the potential impact of extreme natural hazard events on road and rail infrastructure. Training video 2 describes the framework proposed in the project to conduct stress tests according to the overarching risk assessment methodology. Training video 3 introduces the INFRARISK Decision Support Tool (IDST); a software tool that was developed in the project to enable users to perform their own stress tests. Finally, training video 4 presents the Objective Ranking Tool (ORT), which is a web-based multi-user application that can be used for decision making. The training videos may be accessed via the INFRARISK website (https://www.infrarisk-fp7.eu/) and are also available on the YouTube channel (https://www.youtube.com/channel/UCK4VKDQzosT7FwgDtaSRWiA/videos), providing a critical infrastructure training resource to the global community.

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