Venice International University
VIU Summer School
Critical Infrastructure Resilience
September 13-17, 2021

Schedule:
Morning: 9:45 – 12:45, with a coffee break from 11:00 to 11:15.
Afternoon: 13:45 – 17:45
Venue: Room 5X (1st floor)
Social Dinner: Wednesday evening, September 15, 2021

Faculty
Erdem Ergin, Tor Vergata University of Rome (Coordinator)
Carlo Giupponi, Università Ca' Foscari Venezia
Jonas Johansson, Lund University (online)
Carlo Papa, Enel Foundation (online)
Giovanni Valtorta, e-distribuzione (online)
Federico Carturan, RiskApp

Course outline
M1 – Resilience framework and CI concept
M2 – Solution 1 – Establish a baseline
M3 – Impacts & ranking criticality
M4 – Solution 2 – Develop a scenario
M5 – Network resilience across the energy infrastructure
M6 – Solution 3 – Set up a timeline for action
M7 – Decision-making under uncertainty
M8 – Solution 4 – Prepare a situation report
M9 – Cascading impact software
M10 – Cascading impact evaluation

Day 1 – Monday September 13
9:45 *Welcome coffee and Registration (Atrium, 1st floor)*

Morning: Erdem Ergin, Tor Vergata University of Rome
Module 1 – Resilience framework and CI concept
The first session will provide background information on critical infrastructure and resilience, with a look on the concepts behind them. The session will therefore include a discussion on the structural changes affecting our society as a whole and the drivers of risk. The session will then look at the challenges of building resilience and how critical infrastructure is a strategic entry point.

Afternoon: Erdem Ergin, Tor Vergata University of Rome

Module 2 – Establish a baseline

This session will introduce the first solution for CI risk assessment and/or crisis management. Participants will work in groups to identify a CI of their choice and then find the relevant information to its normal operation performance and its connectivity. The baseline reflects the "business as usual" scenario and subsequent scenarios will take it as reference to assess impact and identify appropriate risk management and/or crisis management strategies.

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Day 2 – Tuesday September 14

Morning: Jonas Johansson, Lund University (via zoom)

Module 3 – Impacts & ranking criticality

This session will explore ways to understand the complexities involved with our society's interconnected critical infrastructures and challenges related to addressing their resilience. It will share concrete case studies of past events, such as the European power blackout in 2006, the Eyjafjallajökull Volcanic Eruption in 2010, and the Hurricane Sandy in 2012, and a comparative assessment of infrastructure resilience through empirical failure data. Based on these case studies and other research findings, insights into the effect of interdependencies and cascading impacts are given, e.g. key characteristics to consider and geographical and temporal aspects of different types of critical infrastructures. It will further explore on approaches to rank the importance of assets and infrastructures. The session will also highlight some insight towards the resilience of flows supplied by critical infrastructures during the pandemic based on a case study in Sweden.

Afternoon: Erdem Ergin, Tor Vergata University of Rome

Module 4 – Develop a scenario

This session will introduce the second practical solution for CI risk assessment and/or crisis management. Participants will work in groups to develop a series of scenario for their CI. They will choose a hazard (whether natural or man-made), identify its frequency and intensity, and then discuss the potential impact on the baseline. The scenarios will lead to a discussion on risk assessment and crisis management decisions.

Day 3 – Wednesday September 15

Morning: Carlo Papa, Enel Foundation and Giovanni Valtorta, e-distribuzione (via zoom)

Module 5 – Network resilience across the energy infrastructure

The session starts with an introduction on resilience and infrastructure management, delivered by Carlo Papa, Director of Enel Foundation. It is followed by a case study on "Distribution network resilience against extreme weather conditions: risk assessment and mitigation", delivered by Giovanni Valtorta, head of Network Design, Construction and Standardization for e-distribuzione. Finally, Carlo Giupponi, Dean of VIU, will speak about the Climate Proofing Project, a partnership between VIU, the Enel Foundation and the Euro-Mediterranean Center for Climate Change.

Afternoon: Erdem Ergin, Tor Vergata University of Rome

Module 6 – Set up a timeline

This session will introduce the third practical solution for CI crisis management. Standard emergency plans include list of actions and a task division, but they fail to indicate the order of actions. This often creates confusion and leads to unnecessary harm and damage. The idea of building a timeline for the aftermath has proven very useful as it allows to make some critical decisions before the impact. Hence saving time and resources. Participants will work in groups to develop a timeline for the CI and the scenario they have worked on.

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Day 4 – Thursday September 16

Morning: Carlo Giupponi, Università Ca' Foscari Venezia

Module 7 – Decision-making under uncertainty

In this session the resilience concept will be applied in the context of how climate change can affect the performance of critical infrastructures and in particular to the case of flood risk in the design of airport infrastructures. A conceptual framework will be proposed, and operational solutions will be presented with a case study. Both quantitative and qualitative information are considered for the design of robust plans, i.e. plans that could be resilient to expected climate change impacts. Acquired information are managed in a multi-criteria analysis decision support system, making use of data mining techniques to identify preferable solution within a set of alternative ones.

Afternoon: Erdem Ergin, Università degli Studi di Roma "Tor Vergata"

Module 8 – Prepare a situation report

Crises are powerful agents of change. They can wipe out years of efforts, but they can also serve to accelerate positive change if dealt with properly. Past disaster experience indicate that decision-making is the single most important factor for building resilience through crises. This session will present the single most important decision-making tool, the situation report. It is commonly used by organizations to properly assess the impact, the uncertainties, the taken actions. And then to guide decisions for CI management.

Day 5 – Friday September 17

Morning: Federico Carturan, RiskApp

Module 9 – Cascading impact software

Afternoon: Federico Carturan, RiskApp

Module 10 – Cascading impact evaluation examples

These two sessions will cover the methodologies currently used to perform a critical infrastructures risk assessment, in particular the literature sources suitable to get downtimes due to natural events will be reviewed, a methodology to collect the expert judgement used to adapt the data points from literature to specific infrastructures will be analyzed. Moreover, obtaining the correct hazard scenario is another key activity for a proper CI risk assessment, a survey of the best references for earthquakes, flooding, high temperature, sea level rise etc. will be presented. The general framework of a computational risk assessment will be presented and, subsequently, an interactive exercise of risk assessment will be conducted on a selected CI element using the aforementioned methodology.