

IMPROVER

IMPROVED RISK EVALUATION AND IMPLEMENTATION OF RESILIENCE CONCEPTS TO CRITICAL INFRASTRUCTURE



CRITIS
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Paradigm shift: from protection to resilience



- Protection has been deemed impossible for unexpected events, too costly as well as potentially leading to a false sense of security
- Resilience:
 - “The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management” - UNISDR
- Resilience is really nothing new
 - There is a strong desire to incorporate existing methods and information, without overloading operators with new analysis techniques

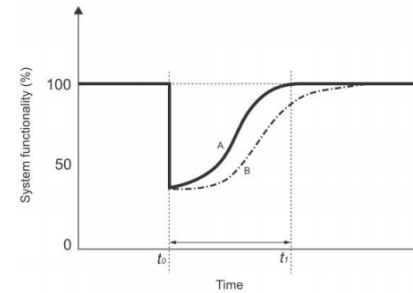


IMPROVER: objectives

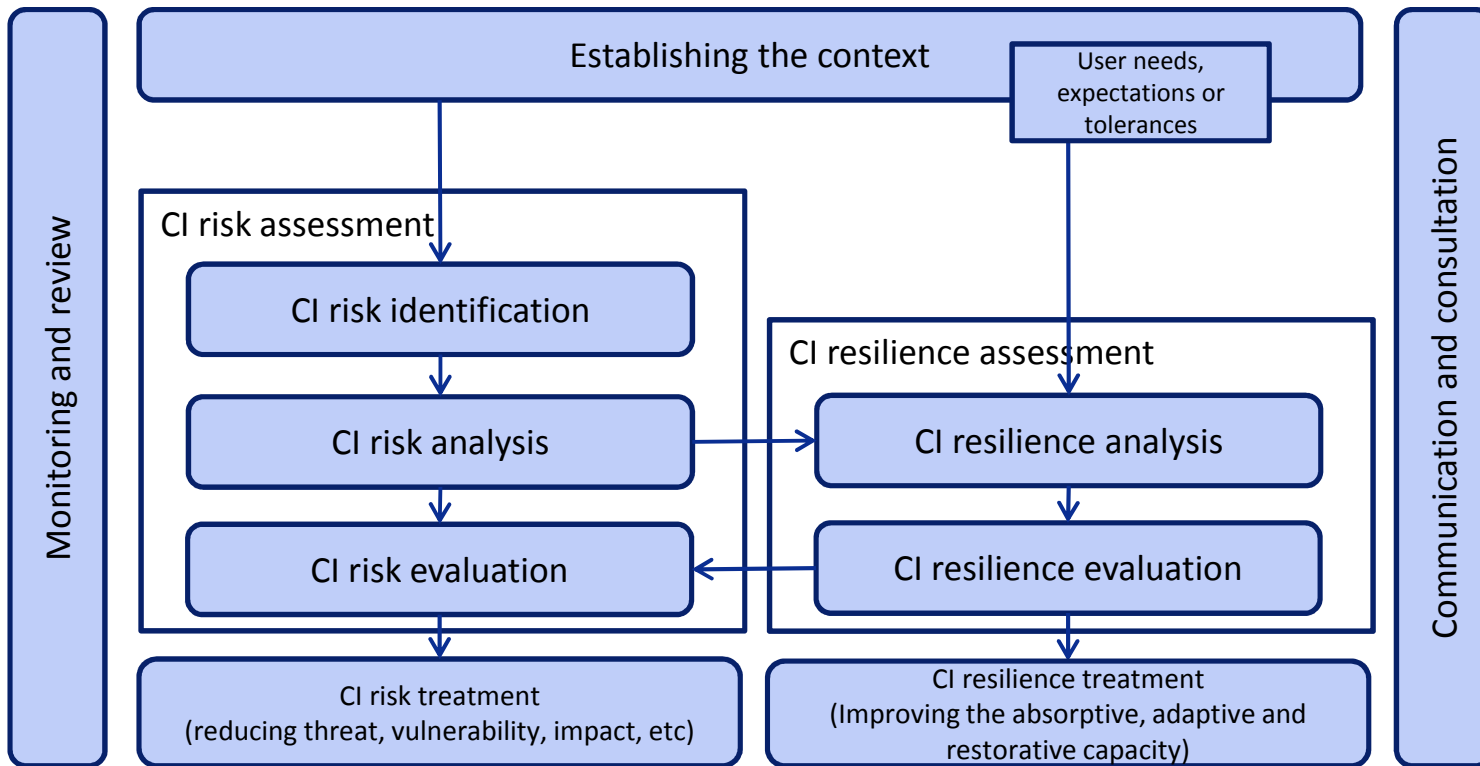
- Understand the definition of resilience
- Understand how this can be measured
- Help operators to measure, evaluate and improve the resilience of their infrastructure **via a framework**



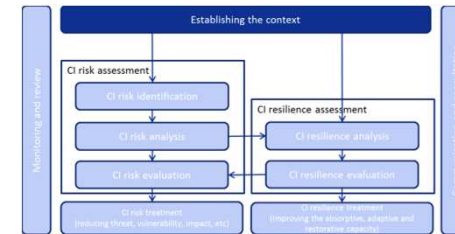
- **With the ultimate goal of maintaining the ability of systems to continue to provide the service required**



The IMPROVER Framework

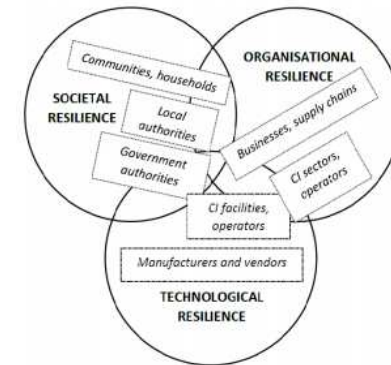


Establishing the context (1/2)

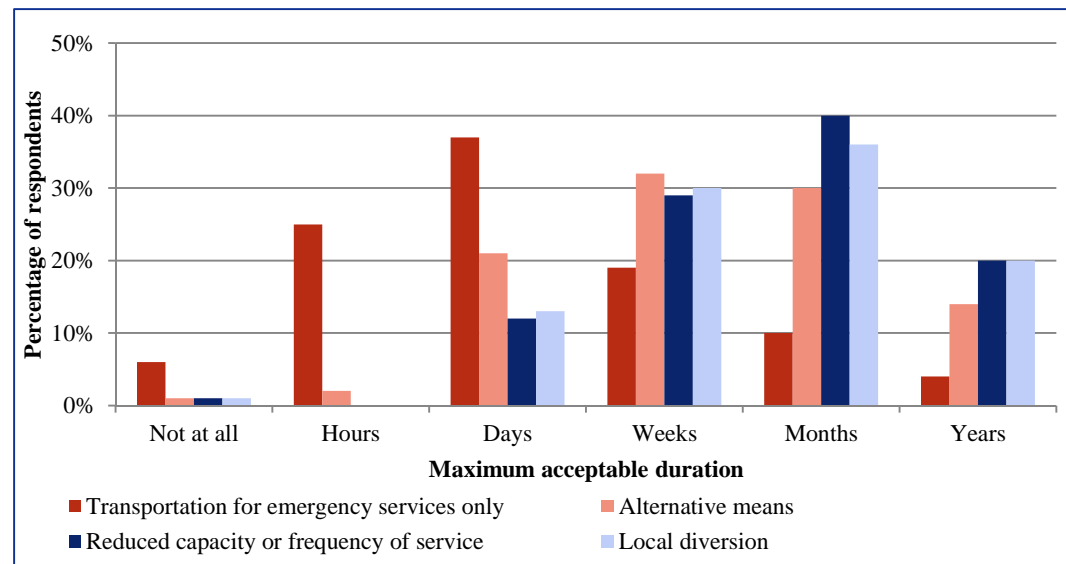
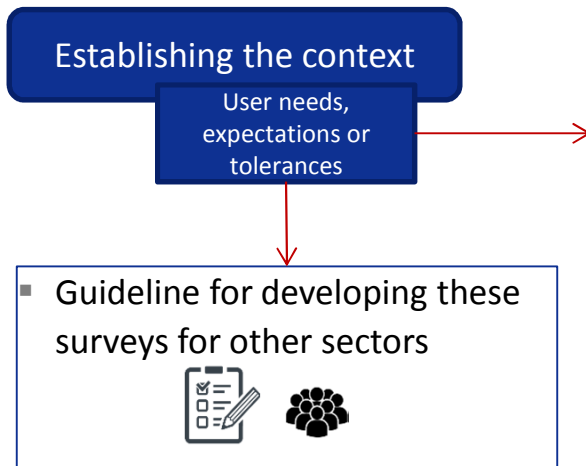
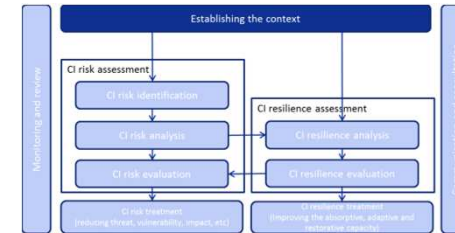


Establishing the context

- Systems identification
- Determine resilience domains of the analysis
- Set system boundaries
- Outline structural components
- Set performance measures
- Criteria for risk and resilience evaluation
- Existing methods and approaches for risk and resilience assessment

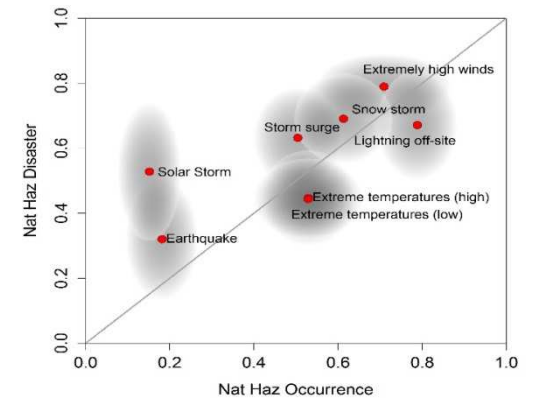
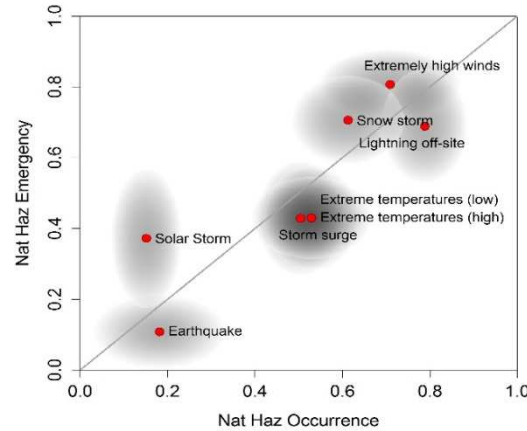
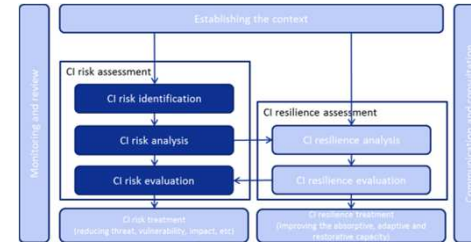
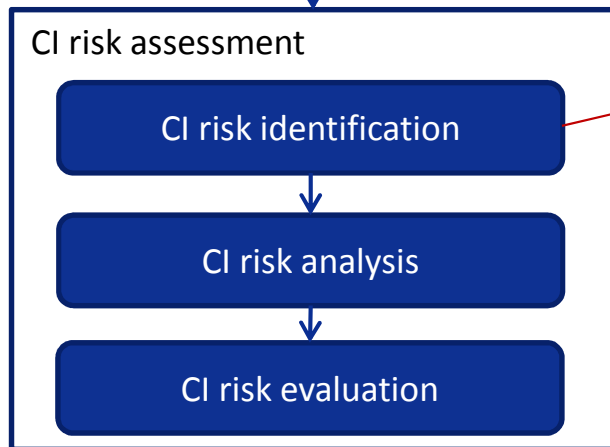


Establishing the context (2/2)

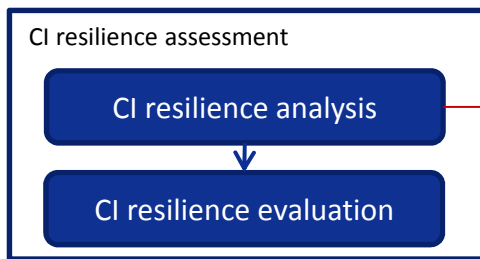
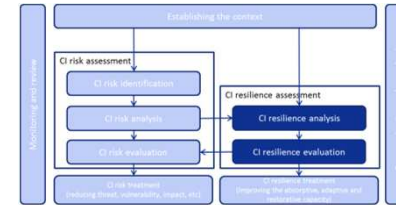


CI risk assessment

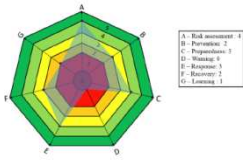
Best practices, operator risk assessments, national risk assessments, sector specific guidelines and methods



CI resilience assessment



- Other similar organisations
- The same organisation over time
- The performance with user expectations



IMPROVER methodologies:

The diagram shows the IMPROVER methodology structure. It starts with 'The context (Domain, Hazard, Situation)' leading to 'CIRI Accumulated resilience index'. Below this are four levels: Level 1 (Given, A-G), Level 2 (Given, A/NA, Additions possible, B1-Bn), Level 3 (Mainly given, A/NA, Weighted, Additions possible, B1.1-B1.m), and Level 4 (Specific indicators, X1.2). A note at the bottom states 'Transformation of specific indicator metrics to process maturity levels'.

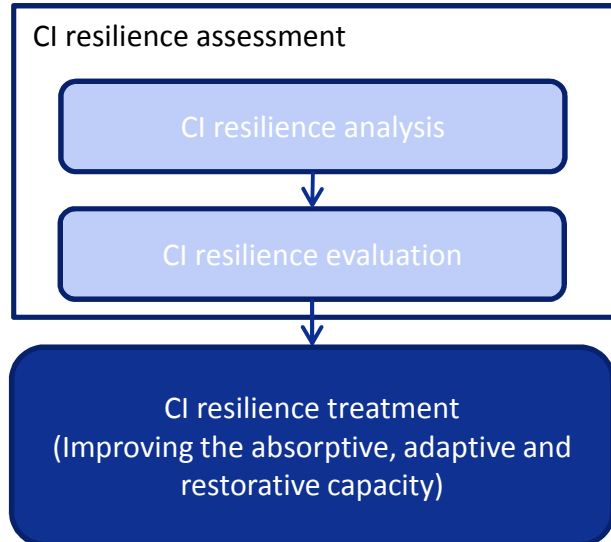
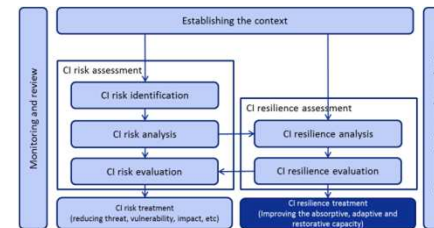
The diagram shows the 'Promoting resilient performance' process. It is organized into four rows: PURPOSE (Promoting resilient performance), FUNCTIONS (Design of tasks and roles, Artefact design, Strengthening collaboration, Learning and re-design, Underlying values and interpretations), FORMS (Building to context, Focus on task, Building personal relationships, Analysing adaptive behaviour, A systems perspective), and PROCESSES (Understanding of real work, Analysing functions, tasks and work needs, Giving mandate to act adaptive, Analysing both past risks and everyday work). Below the processes, specific actions are listed: 'Engaging personnel in development', 'Giving personal mandate to make decisions', 'Knowing organisational purpose and functions on different abstraction levels', 'Collaborating in everyday work', 'Creating good conditions for communication', and 'Using findings for re-designing artefacts'.

$$R_{Tcon} = \int_{t_0}^{t_0+t_{ref}} Q dt$$

A graph showing Performance, Q, on the y-axis and Time, t, on the x-axis. The performance starts at Q0, drops to Q1 at time t0, then recovers to Q2 at time t1, and finally reaches Q3 at time tref. The total time interval is t0 to t0+tref.

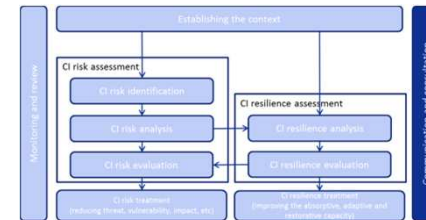


CI resilience treatment




- Detailed statement of:
 - Technological resilience: which of the absorptive, adaptive, restorative capacities the system under study is deficient in
 - Organisational resilience: which organisational process(es) need(s) to be improved
 - Across multi-domains: which resilience indicators need to be improved

Communication and consultation



Communication and consultation

- CI communication guidelines
 - managing expectations
 - promoting engagement with the public




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A Communication Strategy to build Critical Infrastructure Resilience

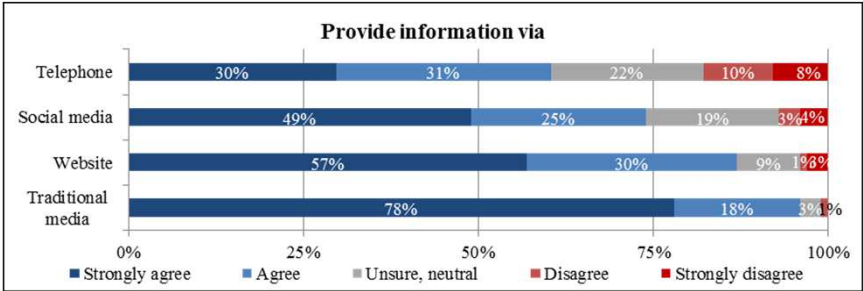
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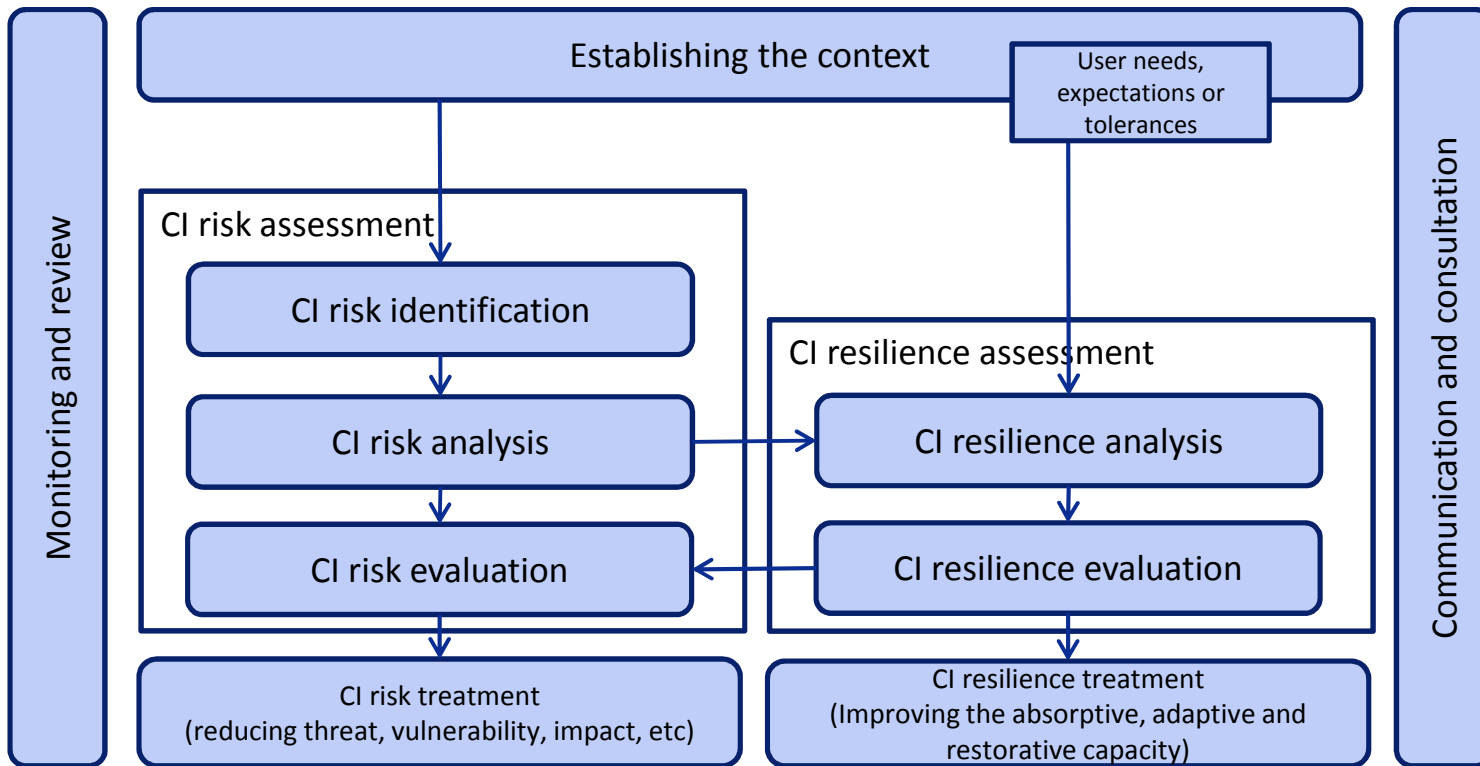
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The IMPROVER Framework



Testing the IMPROVER framework: Pilot Implementations



- 5 living labs:

- Municipality of Barreiro
- French A31 highway
- Budapest M1 Highway
- Port of Oslo
- The Oresund Region



Highlights and ongoing work



- To operationalise resilience, needs to be integrated into existing security activities
 - Enriches risk assessments with information about the resilience of critical infrastructure

- We propose
 - A generic framework for the integration of resilience management into risk management
 - 4 methodologies for resilience analysis

- Pilot implementation of the framework
 - Using various analysis and evaluation methodologies
 - Applied to the municipality of Barreiro and the ring road around Budapest



Thank you!



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