



AN INTRODUCTION TO THE HORIZON 2020 PROJECT IMPROVER
IMPROVED RISK EVALUATION AND IMPLEMENTATION OF RESILIENCE CONCEPTS TO CRITICAL
INFRASTRUCTURE

David Lange, SP technical research institute of Sweden
david.lange@sp.se

www.improverproject.eu

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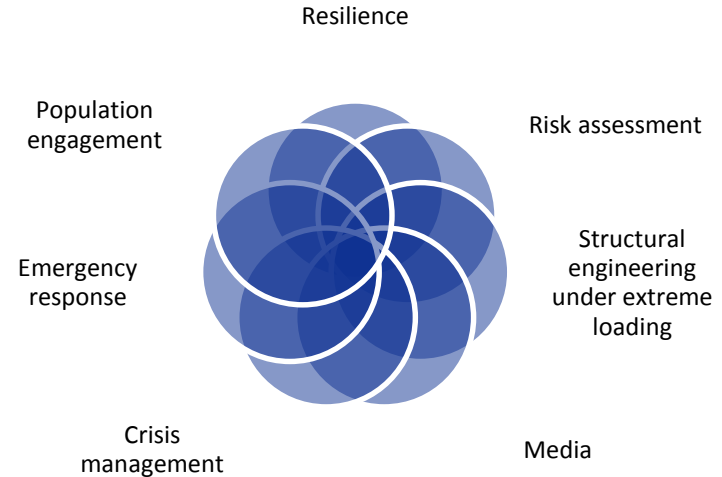
The topic

- IMPROVER was prepared in response to the Horizon 2020 secure societies work program, topic DRS-7-2014: Crisis management topic 7: Crises and resilience – operationalizing resilience concepts
- Increased european resilience is a topic of high concern to both:
 - man made threats and
 - natural hazards
- There is a need to break down the description of resilience and apply it to different sectors
- Start date 1st of June 2015
- End date 31st of May 2018



The partners

- Multi-disciplinary consortium
 - 10 partners
 - 7 different countries
- Also include researchers who are involved in both ERNCIP and EPCIP



Living labs and associate partners

- We are working within four "living labs", comprised of the projects associate partners:
 - The Oslo harbour region
 - The Öresund region
 - The A4 highway in France
 - Water supply and distribution in Bareiro
- These are clustered regions of different types of infrastructure which provide specific services to a city or region
- In addition to these, we have associate partners of the project in:
 - Michigan
 - Toronto
 - Queensland
 - Regensburg



What is critical infrastructure?

Critical infrastructure is an asset, system or part thereof located in Member States which is essential for the maintenance of vital societal functions, health, safety, security, economic or social well-being of people, and the disruption or destruction of which would have a significant impact in a Member State as a result of the failure to maintain those functions. Examples of critical infrastructure include supply of basic services like water, food, energy, transport, housing/shelter, communications, finance, health.

Council Directive 2008/114/EC of 8 December 2008 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection. Official Journal of the European Union, 23 December 2008.

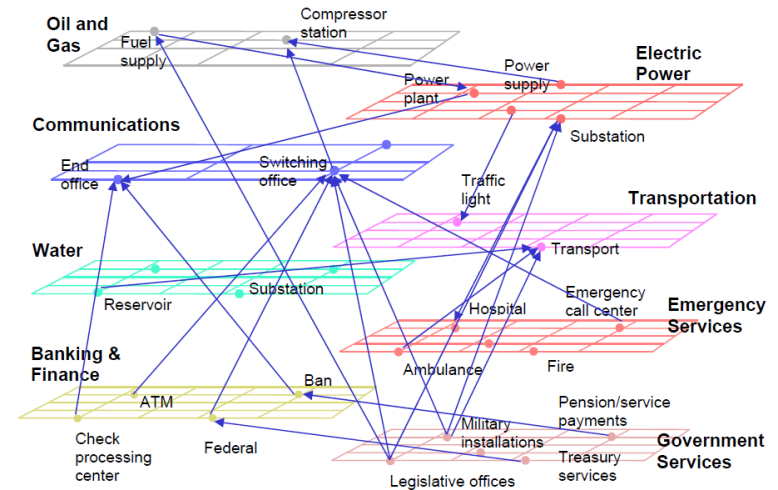
■ Characteristics of CI:

- Complex (technical) systems,
- Exposure to several types of hazards,
- Serious consequences of failure,
- Interdependencies with other types of infrastructure.



An interconnected society

- **Highly interconnected society** reliant on critical infrastructures providing centralised services
 - Contextual if not territorial...
- **Cascading failures** between critical infrastructure systems mean that the **indirect consequences of natural and man-made disasters may be more severe than expected**



The Institute of Public Utilities; Technical Assistance Briefs: Utility and Network Interdependencies: What State Regulators Need to Know; The National Association of Regulatory Utility Commissioners; April 2005

Protection of infrastructure...

Shift in focus from CI protection...

- Safety of assets cannot be ensured by all means.

... to resilience of CI

- New policies and research initiatives shift the focus to **resilience** rather than protection.





Engineering resilience

- Engineering resilience of a system focuses on
 - ...**resisting** any disturbances in order to maintain its **current state**, its **functionality** or its **consistency**
 - ...minimising the **time**, **costs** and **risks** needed to return to a normal state
- Engineering resilience can easily be described as “bounce back”.

Engineering
resilience



Organisational resilience

- Relates to the organisations and institutions that manage the physical components of systems.
- There is **a close link between organisational resilience and business continuity**
 - business continuity as a discipline has organisational resilience as its objective

Engineering
resilience

Organisational
resilience



Economic resilience

- Resilience in economic terms translates to the **minimization of losses** and **rapid recovery**

Engineering
resilience

Organisational
resilience

Economic
resilience



Social resilience

- The ability of human systems to learn and to adjust
- Components of social resilience include:
 - **Learning** and **flexibility**
 - **Social capital** (including trust and social networks)
 - **Social memory** (including experience for dealing with change)

Engineering
resilience

Organisational
resilience

Economic
resilience

Social
resilience



Ecological resilience

- Ecological resilience focuses on persistence and robustness of a certain ecological system
 - There are many varied stability domains

Engineering
resilience

Organisational
resilience

Economic
resilience

Social
resilience

Ecological
resilience



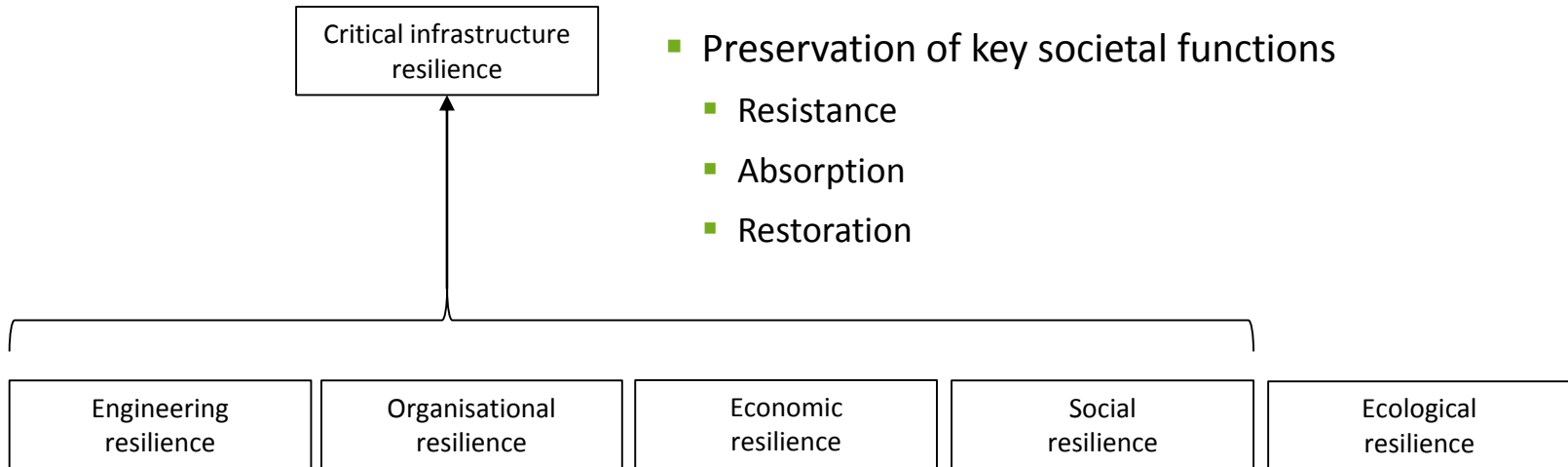
Community resilience

- A ***multidimensional*** resilience concept
- Prevents **disaster-related health or mental problems** of community members
- Related to effective **organisational behavior** and **disaster management**



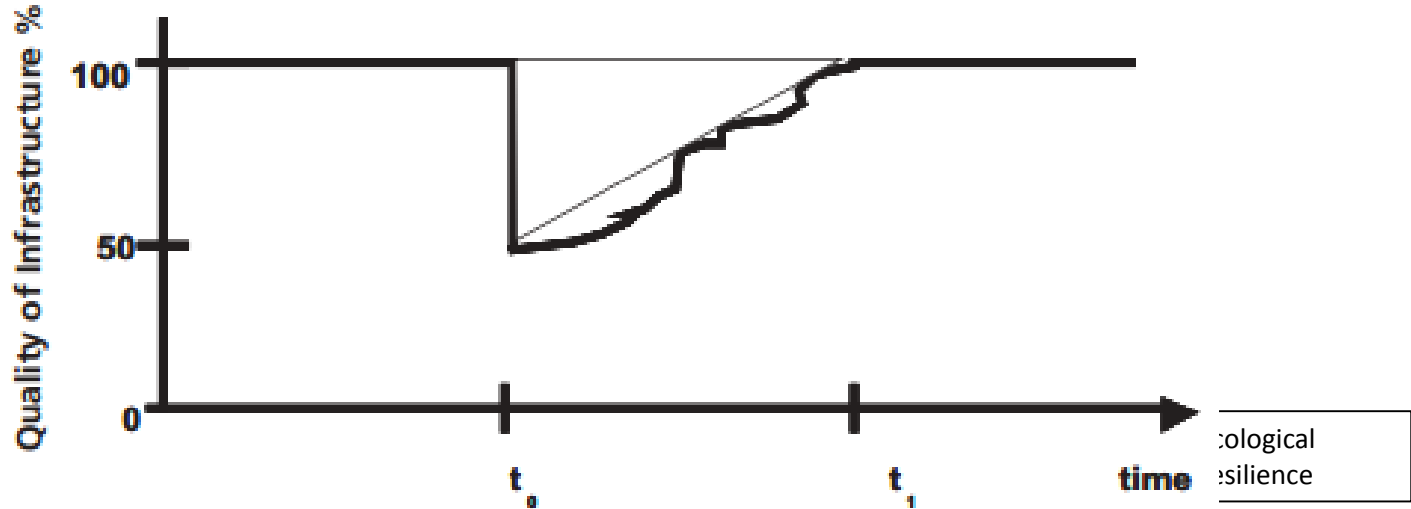
Critical infrastructure resilience

- Definitions refer to an infrastructure component, **system** or network
- Preservation of key societal functions
 - Resistance
 - Absorption
 - Restoration



Critical infrastructure resilience

- Definitions refer to an infrastructure component, system or network



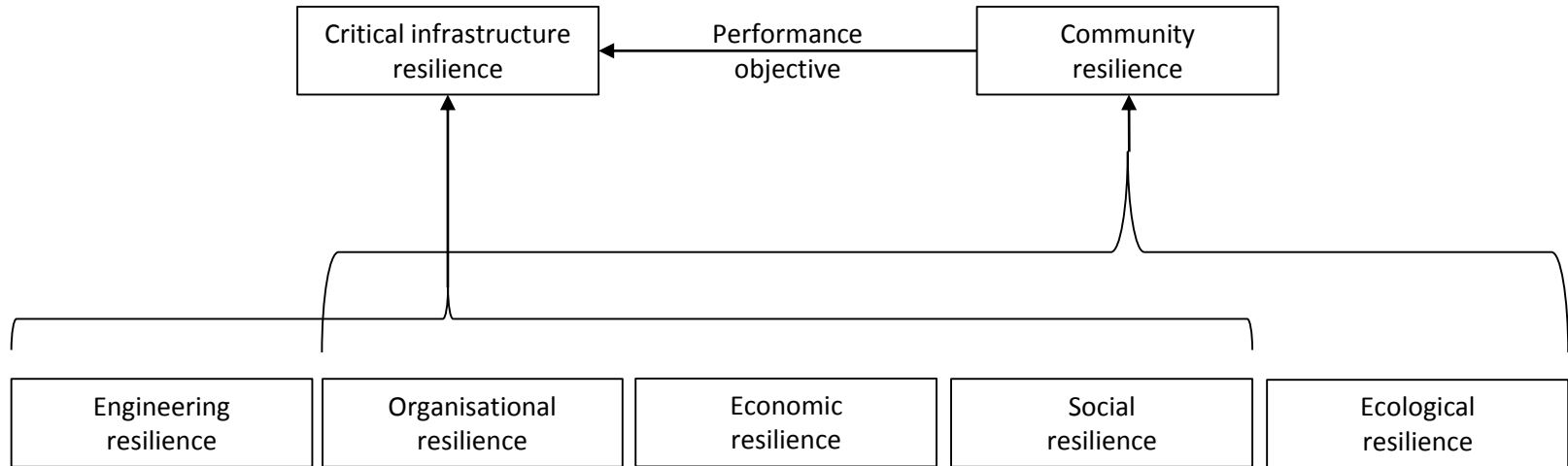
Engineer
resilience

Ecological
resilience



Critical infrastructure resilience

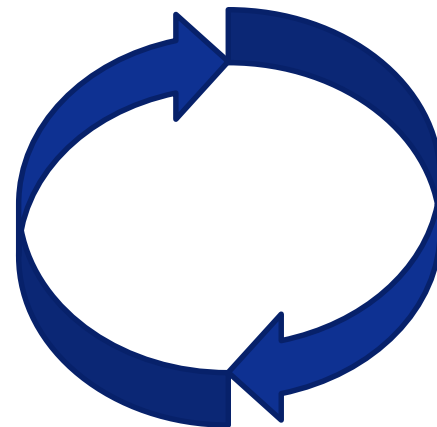
- *Critical infrastructure is essential for the maintenance of vital societal functions*



Implementation

- **National risk assessments**

- E.g. consider all hazards occurring 1/100 years
- Floods, Severe weather, Wild/Forest fires, Earthquakes, Pandemics/epidemics, Livestock epidemics;
- Industrial accidents, Nuclear/radiological accidents; Transport accidents; Loss of critical infrastructure; Cyber attacks; Terrorist attacks



Implementation (2)

- Risk assessment methodologies are not harmonised across Europe
- There are several national definitions of CI Resilience in Europe
- There is no EU definition of the term
- Most official European documents refer to societal resilience
 - e.g. EU Strategy for Supporting Disaster Risk Reduction in Developing Countries
- Different approaches hamper cooperation between countries and between sectors
 - Inhibit communication
 - Difficult to cooperate in collaborative efforts in crisis management
 - Difficult for the creation of single market in Europe for solutions aimed at critical infrastructure protection and resilience



Project objectives

- The overall objective of IMPROVER is to :

“Improve European critical infrastructure resilience to crises and disasters through the implementation of combinations of societal, organisational and technological resilience concepts to real life examples of pan-European significance”

Resilience is a complex construct relying on multiple ‘resilience concepts’

- 4 sub-objectives:
 1. Improve our understanding of the application and interaction of different resilience concepts
 2. Evaluate the baseline requirement of critical infrastructure in the event of a crisis
 3. Development of a resilience management guideline including a methodology for implementation of resilience concepts to critical infrastructure
 4. Pilot implementation of the proposed methodology in application to critical infrastructure of European significance



Project implementation

- Implementation of the project is in 3 stages:

Stage1: A **survey** of available approaches for the definition, implementation and evaluation of resilience concepts to critical infrastructure

Stage 2: An **evaluation** of promising available approaches and further **development** to improve their effectiveness, linking the developed approaches with EU risk assessment guidelines


Stage 3: A **demonstration** of the methodologies, which are presented in the guideline, in operation



Project implementation

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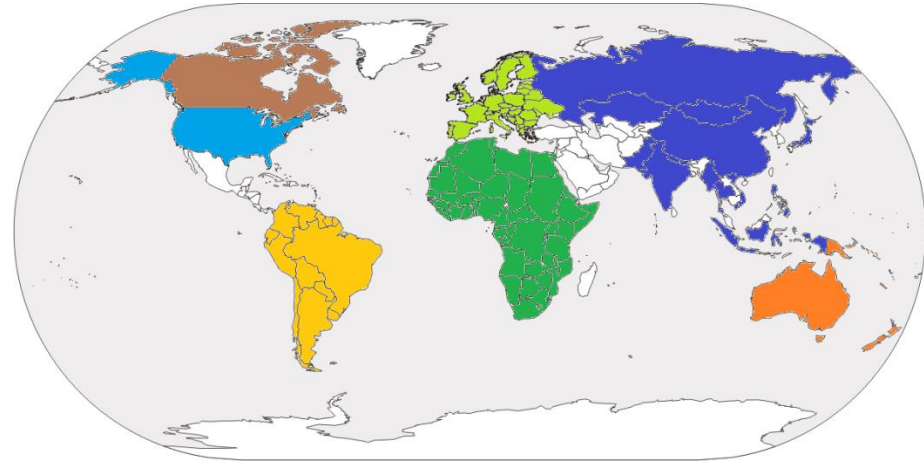
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Stage 1: International survey

- Short description of whether the region is prone to disasters
- Description of recent disasters
- Definition of the concept of resilience
- History of the concept of resilience
- Known official documents on resilience
- Who is responsible for delivering resilience
- Implementation of:
 - technological resilience(known official documents, guidelines, training, etc.)
 - organisational resilience
 - societal resilience
 - economic resilience



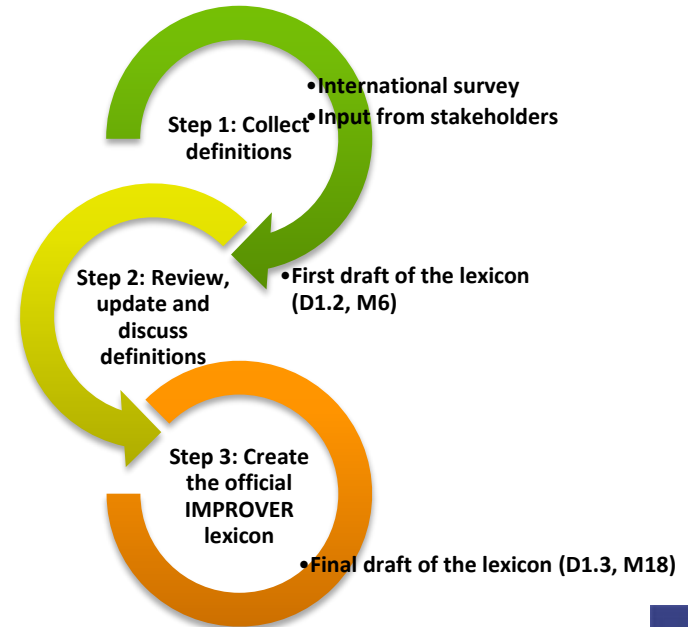
Stage 1: Different focus in national approaches

- Resistant / absorptive / restorative capacity
- Partnerships / information sharing / risk management
- Preparation / preparedness / response / recovery
- In Australia and New Zealand, focus on:
 - Organisational resilience
 - Societal resilience



Stage 1: Lexicon

- Linked to CIPedia
 - Some definitions drawn from there
 - New definitions to be added to CIPedia
- First draft delivered in M6
- Final 'draft' to be delivered in M18
 - Liaison with other projects
 - Operators
 - Other experts



Stage 2: Scenario identification

- Structured elicitation of expert judgement
- Comparing:
 - Natural / Technical / man made hazards
 - Likelihood to occur
 - Likelihood to cause a disaster
 - Likelihood to cause an emergency

*When comparing two **natural hazards**, which is **more likely to occur in the Öresund region in the next 5 years?***

Place an "R" if the incident on the row is more likely to occur,
 "C" if the incident in the column is more likely to occur,
 or "=" for equal likelihood to occur between row and column.

Fill in the empty boxes above the diagonal.

Please do not leave any of the white boxes empty.

	1. Earthquake	2. Storm surge	3. Heavy rainfall and flooding	4. Extremely high winds	5. Extreme temperatures (high)	6. Extreme temperature (low)	7. Lightning	8. Snow storm	9. Solar storm
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9. Solar storm									

Stage 2: Public survey

- Ask the public *their* opinion
 - Tolerance for interruption
 - Tolerance for drop in quality of service
 - Different sectors
- Available in English / Swedish / Danish / Norwegian / French / Portuguese
- Set the performance objective for CI resilience?

Public expectations for critical infrastructure during disasters

Welcome

We would like to ask you to complete this questionnaire, which will explore public expectations for critical infrastructure during and after disasters.

Before completing the questionnaire, please read the Background Information Form and fill in the Interview Consent Form.

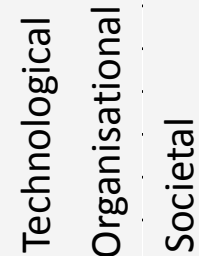


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Outlook

- We are currently selecting promising methods of implementing resilience in critical infrastructure for evaluation
- We plan on comparing the expectations of society with the performance of the infrastructure to different hazards
- Our aim is a **risk based approach**, where **the reliance of society on the function which the infrastructure provides**, and tolerance for its interruption **can be used to set the performance objective of the critical infrastructure**





DBI



*maîtriser le risque
pour un développement durable*



The
University
Of
Sheffield.



European
Commission



**Fire
Research**



